Hardware Review
Madison Computer's Z-RAM Card

What would you say if you were offered a simple way to multiply the number of applications available for your Commodore system ten-fold, have access to a number of high-level computer languages, plus have expanded user memory and a number of advanced hardware interfaces . . . all at the same time?

You would probably answer that all this is pushing things a bit too far, especially on a PET or CBM computer. Well, we're not dreaming and all this is possible using a simple hardware add-on for your system which allows you to use CP/M® (Control Program for Microprocessors).

As a bit of background let's take a look at what CP/M is, in general, and then how you can use its power on Commodore equipment. One of the problems with microcomputers, in fact any computer, is that each has a unique set of commands that control the system.

But at the lowest level, each computer must perform the same tasks: get data from the keyboard, print information and handle disk activity. These tasks are usually handled by a "manager" referred to as an operating system.

On the standard PET, a combination of BASIC and DOS (Disk Operating System) perform these activities. If you're just using PET programs everything's great, but what happens if you want to use a program designed for some other system? For the most part—tough luck. Without extensive modifications to the program—the time and expense is hardly worth it—there is no way an alien program will run on a different system than it was designed for because each operating system was produced for a unique piece of hardware.

Fortunately, in the early days of microcomputers this problem of incompatibility was addressed, and CP/M was born. The unique thing that makes CP/M so popular is that in the design of the system all the hardware dependent parts of CP/M were put in one part of the program. This way, a developer can change just those portions of CP/M that involve specific hardware, without touching the main application. Since no changes are required to the main program, it can be used by any system capable of running CP/M.

CP/M On The PET

CP/M has two hardware requirements that are not met by standard Commodore equipment. The first is: CP/M was originally designed around an 8080 microprocessor. Since the PET contains a 6502, whose instruction set is not compatible, a different microprocessor must be added to the PET. The second requirement is that the system must have at least 48K of user memory, which the PET normally doesn't contain.

The way around this is a hardware add-on that provides a Z-80 microprocessor (8080 compatible) and additional user memory (RAM). The Z-RAM card from Madison Computer (1825 Monroe St., Madison, WI 53771 and distributed by Computer Marketing Services in Cherry Hill, NJ) opens up the world of CP/M to your PET.

Z-RAM Card

Physically, Z-RAM is a separate card containing a Z-80 microprocessor, a 6502 processor and 64K of additional RAM. The card is designed to fit inside the top part of the PET enclosure, directly under the monitor. Four mounting screws make the physical installation a snap.

Z-RAM is designed to work with either a 40-column PET or 80-column 8032 system. The advantage of using the 8032 is that most CP/M programs were originally designed to support 80-column terminals. In fact, the 8032 is looked upon as a terminal by the Z-RAM card.

The only electrical connections involve unplugging the power cable to the main PET motherboard, and connecting this cable to the Z-RAM board. Another cable then brings power from the card back to the PET. The final connection involves removing the 6502 microprocessor from the PET's main logic board and attaching a 40-conductor cable from the Z-RAM card to the 6502 socket.

All of this only takes a few minutes to complete. The cables are "keyed" allowing them to be inserted only one way. Then just close the case and go on.

The construction of the Z-RAM card is excellent, with all critical circuits socketed. The card also shows no signs of last minute "fixes" which normally appear as external point-to-point wiring. The RAMs are state-of-the-art 64K low power devices, thus keeping overall board size to a minimum. You have the full 64K RAM work space also.

In using this extra RAM from the PET, you can split memory to accommodate three programs simultaneously. The first bank contains 26K RAM with the second and third banks each containing 32K RAM. This is advantageous for large programs since the wait normally associated with going to the disk to bring in another part of the program is eliminated.

In operating the card in this mode the thing you must watch for is programs that leave disk files open. Switching to another program without locking things up properly will probably cause loss of data.

Z-RAM supports printers either through the standard Commodore IEEE-488 interface or through Madison Computer's McTERM RS 232 serial port. McTERM is their comprehensive communication package which uses a connection to the PET's

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user port to supply a standard RS 232 signal.

To use CP/M with Z-RAM, just boot the supplied CP/M disk. After a short wait—CP/M is a small program—the opening message will be displayed along with the CP/M ready prompt. Another side note: CP/M is not the most efficient with disk space.

Using Commodore's 8050 disk with a total of 500K on a diskette will give you a most effective operating environment. Though using a 4040 or 2031 single disk is certainly acceptable, just a bit inconvenient.

CP/M Operation

The nice thing about CP/M is that once you learn it, the operation is the same for all CP/M based systems, not just the Commodore implementation. Remember, we mentioned compatibility earlier!

There were no surprises in using version 2.20B of CP/M supplied with Z-RAM. Each operation provided the expected results, from getting a directory of the disk to using a standard CP/M application.

To get general again for a moment, you may be interested in exactly how CP/M differs from standard PET operation.

Rather than naming the disk drive units '0' and '1', which is standard with CBM disk units, CP/M names disks 'A:' and 'B:'.

The CP/M system prompt will be 'A>' or 'B>', depending on the drive you select. This is called the "logged" drive. From this point you can get a directory of the programs on the disk, inquire about specific information regarding a file or the entire disk, perform housekeeping duties such as file transfer and disk formatting, and, of course, run specific programs.

The standard CP/M disk supplied with Z-RAM contains the support programs to perform the functions mentioned above. In addition, the standard Microsoft BASIC language is included.

A CP/M directory will look quite different from a standard CBM disk catalog:

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A>DIR
A: FORMAT  COM : COPY      COM : MBASIC  COM
A: PIP     COM : STAT      COM : ED      COM
A: ASM     COM : DOWNLOAD  COM : WS      COM
A: PR MENU BAS : PR PGR    BAS :
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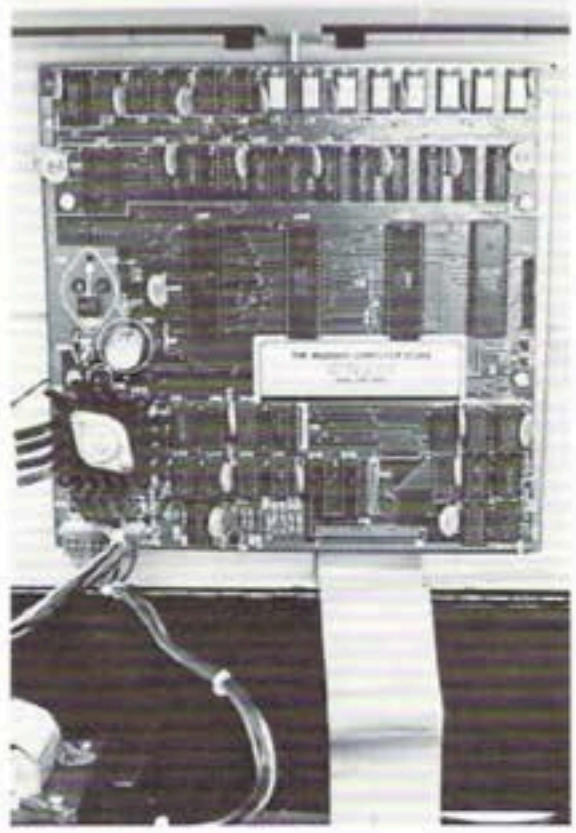

Looking at the directory, you can usually tell the type of file by the suffix, i.e., 'COM', 'BAS', etc. A COM file is a command file, which requires you to just type the file name and it will be executed immediately.

A 'BAS' file is a BASIC program that requires the loading of the Microsoft BASIC language first. Once that's accomplished—by typing MBASIC—you can type "RUN FILENAME" and the BASIC program will be loaded and executed. Remember that in using BASIC, memory is taken up by CP/M, then BASIC, and finally the application.

But the real power of CP/M, again, is in the number of applications available, and the portability of those programs.

In testing the Z-RAM card, a number of standard CP/M applications were run through their paces, and each performed flawlessly. In fact, to get some of the applications on CBM formatted disks, a CP/M communication program was used to transfer CP/M programs from another system to a CBM 8032.

Because CP/M based programs are designed to run on various sytems, most programs are supplied with an "install" utility. This does the final set-up of the CP/M application so it will run on a specified piece of hardware.

Install usually configures the program for a particular type of terminal. Since the Z-RAM card can make the PET look like a number of standard terminals, there was no problem configuring a CP/M program like WORDSTAR, the premier word processing package, to run properly.

In the seven years that CP/M has been around, thousands of programs have been created that run under it, written by over 100 companies. Applications range from languages including business BASIC, FORTRAN, COBOL and Pascal, and development utilities like assemblers, to application programs such as accounts payable/receivable, data bases, financial planning, and word processing.

The Z-RAM card is an ideal way to gain access to this wealth of software for your PET. ■

—Mike Heck

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