## Review The PEDISK From CGRS Microtech

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The addition of a disk to ones microcomputer system is a need that becomes evident after a short period of loading programs from cassette tape. Any attempt at even modest data handling amplifies this need. For the owners of the original 8K PET computer, this presents a problem in that Commodore's disk system is incompatable with the original ROM operating system. For those of us who purchased the early PETs, there is an alternative to updating the ROM operating system or selling our old PETs in order to add disk capability. The CGRS PEDISK goes beyond offering a high speed means of loading programs and saving data in that it also provides access to the S-100 buss. This offers expansion not only in terms of memory, but a host of other possibilities such as analogue to digital boards, modem boards, etc.

In the standard configuration the CGRS PEDISK system offers two free S-100 slots. It is possible to add another S-100 connector at additional cost. The 5.25 inch drive uses soft-sector diskettes. The format is the IBM 3740 standard. This provides 80K of storage per drive. A total of 4 drives can be handled by the S-100 disk controller board.

Although this system was originally designed to operate with the original PETs, it is now available for the newer 16 and 32K versions.

## The Disk Operating System

The disk operating system provided by CGRS is partially in ROM, but is basically a RAM oriented DOS. Although there is an overhead with such an approach (about 2K of memory is taken up by the DOS), the advantage of having the DOS in RAM rather than ROM is that it is possible to make modifications, be they up-dates or correction of bugs.

The DOS is initialized by a SYS call to a boot starting in ROM at hex B000. The disk operating system is loaded into the top 2K of RAM and is subsequently protected.

Loading and saving programs is accomplished by preceeding the usual BASIC command with a "! ", for example:

!LOAD"program name:0"

where 0 is the number of the disk drive. Unlike program names on tape, program names on disk are limited to 6 characters. Provision is made for renaming programs or data files. As with any disk system, duplicate programs are not allowed.

One of the most appealing features of the DOS lies in its file handling capabilities. Files may be opened as serial access or indexed types. In the first case, files are written and read from the first entry to the last. In the case of indexed files, any record may be written and/or read back in any order. Once a file has been opened for writing purposes, it may be reopened for reading and/or editing. This allows one to examine a file record by record and perform editing (rewriting) on a record by record basis. There are two reserved variables for checking on successful file write and on encountering the end of file. File closing is automatic with the command !CLOSE or when the system is initialized. Up to four disk files may be opened at one time and each maintains its own index counter through a common reserved variable. Commands normally used in dealing with tape files are proceeded by "!" in the case of disk files, i.e. !INPUT F\$ Z\$ where F\$ is the string containing the file name.

The command !SYS transfers control to the disk monitor. Here commands can be entered as a single character without using the return key. In this mode keying in "H" will list the currently available single key commands. It should be noted that in this mode, any current BASIC program will remain intact and pressing "R" will return one to the BASIC operating mode.

Commands in the DOS monitor mode include DUMP which will cause a formatted dump of either memory or disk sectors, GO to execute a machine language program, KILL to delete a file from the disk, LOAD to load a program without execution, MEMORY, a command to examine and change locations in memory, PRINT the volume table of contents of the disk, RENTER the BASIC operating system, SAVE to save a BASIC or assembly language routine and UTILITY to access routines to compress disk files, copy disks, read or write a disk sector or initialize a diskette. All of these commands are actuated by typing in the first letter of the command.

In short, the DOS affords a very neat package especially with respect to data file manipulation. Documentation is adequate, especially if you have had some experience with other disk operating systems. As with any new system, some experimentation will be necessary for the user to become familiar with all the features of the system. Not all of the commands mentioned under the monitor will work from the BASIC control mode but this minor bug will doubtless be corrected in future editions of this program. This is a great advantage in a RAM oriented DOS. I found the software to be relatively free of BUGs.

Because of the 2K overhed in RAM, it would be advisable to have a minimum of 16K RAM for such a system. The potential user should also be aware that if a change in memory size occurs, an updated version of the operating system must be obtained.

In brief, the CGRS PEDISK offers in a neat package both disk capabilities and access to S-100 buss boards. This latter point has been most important in terms of applications of this reviewer.

## A Disk Operating System for the CGRS PEDISK

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When I first saw the PEDISK in operation nearly three years ago, I was not overly impressed. The capabilities at the time were limited to saving and loading programs with no data file handling. It was not long before this original disk operating system, KMMM (by Wilserv Industries, PO Box 115 Haddon Field, NJ 08033) had been expanded to include full file handling abilities.

The great advantage of any operating system in RAM is relative ease of updating and incorporating improvements. When working with a disk system, the time spent in loading software is not a major problem.

The basic configuration involves initialization via a SYS call to a ROM based boot which loads the DOS into the top end of memory. The user must specify his memory configuration when ordering the DOS software for, although a 24K version will work on a 32K configuration, the top 8K will be unavailable for normal basic programs.

After initialization, the user has a chance to specify a change in the date or his configuration (i.e. number of drives, printer, maximum number of files, etc.).

After any changes have been made, the user may return to the BASIC operating mode or to the DOS monitor. The DOS resides in about 3K of memory so a good minimum memory to use with this system is 16K.

The usual BASIC commands such as LOAD, SAVE, etc. are preceded by a SYS 999 when used with the disk. This saves the user the task of remembering the address of the entry point of the DOS. If the second cassette buffer is being used for an assembly language routine, the 999 address can be replaced by the actual address of the DOS entry point.

All special disk commands can be executed from BASIC. Routines for printing the volume table of contents, compressing a disk, deleting a program, etc. are included here, but the routines are loaded from disk into low memory and may write over a resident BASIC program.

The volume table of contents gives address information on the disk as well as memory. It also provides the date of creation of the disk file and in the case of program files, how many times, and date of, updates.

Provision is made for re-naming files and altering the file load point. The copy/compress routine offers the capability for copying individual files or the total disk. Copying is possible with only a single drive. The format on the disk is the IBM 3740 standard and the capacity is about 80K.

Data files in the present version are sequential only. These may be opened as read or write files but not both and the number of sectors reserved for a file must be specified at the time the file is created. Provision is made when initializing a diskette for omitting the boot, thereby saving more room when only files will be stored. File commands are like tape file commands except they are preceded by the SYS 999 command. Closing a file does not automatically write an end of file mark; this must be done under program control before the file is closed.

Up to 9 disk files can be open at one time (or the maximum number specified at the time the system was initialized). When a disk is formatted without the bootstrap capability, the maximum number of files for that diskette is specified (from 3 to 67).

The only means of updating a file with the present version is to open a second file for writing (with a different name or on a different drive) then read from the first file and write the modified or added information on the second file.

One neat feature of this system is its ability to chain programs. When the SYS999 LOAD' file name' is executed from a BASIC program, the named program will load and run with variables from the first program intact as long as the calling program is at least one sector greater than the program.

Either the contents of a disk or the VTOC may be routed to a printer if the printer option is specified when the system is initialized. The printer must operate on the IEEE port and its specified address.

In the year that I have been using this current and an earlier version of the KMMM DOS, I have found it to be very flexible. It has offered an excellent solution for disk capabilities for PETs with old ROMs.