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RADIO SHACK HARD DISK USER'S GUIDE

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RADIO SHACK HARD DISK USER'S GUIDE

ATON International has implemented the popular, time proven CP/M(R) 2.2 for the Radio Shack Models II, 12 and 16 with the Radio Shack 8, 12 and 30 MEG Hard Disk. This guide gives information which supplements the ATON CP/M 2.2 Reference Manual.

OVERVIEW

- CP/M and TRSDOS™ or CP/M and Xenix™ can co-exist on the same hard disk. An area of the hard disk unused by TRSDOS or Xenix can be set aside for use by CP/M.

- The Radio Shack Hard Disk interface board installed in the Model II or 16 as part of the standard hard disk installation includes 16K of RAM memory. ATON CP/M stores most of its resident code in this area, thus allowing application programs a full 62K which is 6-8K more than is usually available under other implementations of CP/M. Data base management programs such as MDBS can use this extra space to great advantage.

- DMA is used for all data transfers for maximum throughput.

- If the entire disk is dedicated to CP/M, CP/M boots directly from the hard disk. If the disk is shared with TRSDOS, CP/M boots from floppy disk.

- User has extensive control over how the hard drive is allocated. The user can specify:

    - Number and location of cylinders allocated to CP/M.

    - Number of logical drives associated with each hard disk physical drive.

    - Amount of disk space each logical drive will occupy.

    - Allocation block size (2K, 4K, 8K or 16K)

    - Number of entries in directory.

    - Which logical drive letters (e.g., A:, B:) are associated with floppy drive or hard disk logical drive.

- The FILEX file archive utility provides the capability of high speed saving and restoring of multiple files as large as 8 megabytes onto single or two sided floppies. The archived information can be accessed as normal CP/M files while on the floppy diskettes in case of hard disk failure. The FILEX utility can automatically check for proper sequence of floppies when restoring files larger than one floppy.

- The hard disk copy utility allows the allocated area of one hard disk logical unit to be copied, track by track, onto another hard disk logical unit, thus allowing extremely fast hard disk to hard disk backups.

- The hard disk initialization utility (HDINIT) provides three independent functions:
  - Format hard disk area designated by user to be available for CP/M. Flawed sectors and bad tracks are automatically accommodated by this process.
  - Load system code onto first cylinder of the CP/M area.
  - Define disk allocation parameters such as number of directory entries, allocation block size and logical unit characteristics.
- The highly acclaimed ATON CP/M 2.2 for single and two sided floppy disk is included as part of the hard disk support.

PLANNING THE HARD DRIVE INSTALLATION

The ATON CP/M system for Radio Shack Hard Disk provides a high degree of flexibility for installation. It is recommended that you think carefully about how you intend to use the hard disk because changing configurations once the disk has been loaded full of programs can be time consuming. Any change to drive parameters requires that the files on that drive be copied to another hard drive logical unit or onto floppies using FILEX. The parameters can then be changed, the directory cleared with HDCLEAR and the files reloaded using PIP or FILEX.

The first question to answer is whether the disk is to be shared with TRSDOS or Xenix.

Advantages of sharing disk with TRSDOS or Xenix

- Access to Radio Shack programs you are now using.

Disadvantages of sharing disk with TRSDOS or Xenix

- Less space available for CP/M.
- CP/M must be booted using floppy disk.

CP/M can be shared on the same hard disk with Xenix or TRSDOS. The Xenix or TRSDOS format and installation routines allow you to specify the number of cylinders on the hard drive. This is normally 256 for the 8 meg drive and 230 for the 12 meg drive. You can specify a lesser number (say 200) when formatting and initializing Xenix or TRSDOS. Then CP/M can be loaded by specifying a starting cylinder (200 in the above example) after the Xenix or TRSDOS area through the end of the disk. If you have two hard drives, the primary drive can be set up for Xenix or TRSDOS by specifying at least 3 less cylinders for Xenix or TRSDOS than normal. CP/M can then be specified on the last 3 or more cylinders of the primary drive and the entire secondary drive. Whenever you share CP/M with Xenix or TRSDOS, you need to boot CP/M by first booting the floppy disk version of CP/M and then executing HDBOOT.

The disk is shared by having CP/M occupying the inner (high numbered) cylinders and TRSDOS or Xenix occupying the outer cylinders. When a TRSDOS disk is initialized, the directory location can be specified by the user. The preferred location when shared with CP/M is for the TRSDOS directory to be located on cylinder 1. If not specified in the INIT command, the directory will be placed in about the middle of the disk. Thus, unless the user initializes the disk with the directory set for cylinder 1, CP/M will be able to use only cylinders beyond about the middle of the disk.

The CP/M area cannot be accessed by TRSDOS or Xenix and, in like manner, CP/M application programs cannot access any of the TRSDOS or Xenix area. The only way this mutual lockout can be modified is with the TRSDOS or Xenix INIT or FORMAT commands or the CP/M HDINIT utility program. The chances that a faulty TRSDOS, Xenix or CP/M program would be able to access the locked out area of disk is extremely small.

Next, determine the number of CP/M logical drives, their respective sizes (number of sides one to four) and logical drive names (e.g., A:, B: through P:). As delivered, the system will default to two logical drives, A: and B:, each occupying half the CP/M area. The floppy drives are then E:, F:, G: and H:. If your application programs are "hard coded" for particular drive letters, you may wish to change the drive letters assigned to hard drives. System operation is usually a little more efficient if the hard disk is subdivided into several logical drives.

A decision needs to be made regarding the allocation block size. The choices are 2K, 4K, 8K or 16K. If you expect many small files on a drive, use the 2K or 4K option since disk space will be more efficiently allocated. If you expect only a few large files on the drive, use the 8K or 16K option since it will decrease the number of times the system will need to refer to the directory.

The last decision is in regard to the size of the directory. Simply choose a number large enough to include the maximum number of directory entries expected. There is one directory entry for each "extent" of a file. The minimum extent size is:

Allocation Block Size	Extent Size
2K	16K
4K	32K
8K	64K
16K	128K

Thus, there will be one directory entry required for each file and additional entries required if the file is larger than one extent.

The system as supplied has 1024 entries for each drive. This should be adequate for most purposes. Note that under normal conditions the hard drives are never logged offline so the entire directory is never rescanned unless it is full. This eliminates a lot of unnecessary disk activity. Also, the amount of space available to user programs is a constant 62K regardless of how the drives are configured. The last 128 bytes of memory (starting at 0FF80H) are available as a communication area from one program to the next. The last 256 bytes are available until a BDOS function 27 or 31 is executed (e.g., STAT.COM).

An additional feature is the 64 character type-ahead buffer present in the hard disk system. The type-ahead buffer is not present in the floppy based Level I (64K Unbanked) system. Some programs such as MBASIC constantly monitor the keyboard and will "eat" any data keyed ahead for other programs.

INSTALLATION

1. Get the floppy disk supplied with the ATON system and make sure the write protect tab has been removed so the write protect notch is uncovered.

2. Boot up this disk by:

   a. Lifting the RESET switch on the front panel.

   b. Immediately press the ESC or BREAK key until the red light on built-in floppy drive 0 lights up. The ESC or BREAK key must be repeatedly pressed immediately after the RESET switch is lifted until the red light on floppy drive 0 lights up.

   c. Press "ENTER" key. The ATON CP/M 2.2 sign on message should be displayed with serial number.

3. At this point, the floppy disk CP/M has been booted up and you are ready to load the hard disk system. The floppy disk system has no way to address the hard drive and its disk configuration is fixed:

   A: = Drive 0
   B: = Drive 1
   C: = Drive 2
   D: = Drive 3

   The two programs HDINIT and HDBOOT contain a hard disk driver so they can access the hard drive. When these two programs access the hard drive the disk indicator in the upper right hand corner does not reflect hard drive activity.

4. Execute the hard drive initialization program by typing in HDINIT followed by the ENTER key.

5. Select option 0 from the menu and answer the questions it asks. The cylinder number is 0 if the entire disk is to be used for CP/M; or some other number which you have determined if you wish to share the hard drive with TRSDOS or Xenix.

   The final cylinder number in either case is 255 for 8 meg and 229 for 12 meg.

   Type in ENTER in response to the several questions about declaring additional bad tracks. Or, you may wish to declare additional bad tracks, such as those on the bad track map on the bottom of the drive.

6. Now select option 1 to load the hard drive CP/M system code. As described above, the disk indicator in the upper right hand corner will not show hard disk activity even though data is being written to the hard drive. Option 1 only takes a few seconds to execute.

7. You can choose option 2 from the main menu to display or redefine the drive configuration. Answer the questions it asks after choosing option 2. Refer to the section "Planning the Hard Drive Installation" in the user's guide for guidance in answering the configuration questions. Also note:

   a. CP/M 2.2 has the characteristic that it will scan the directory on drive A: during each warm boot (program exit) for a possible active SUBMIT file. Thus it is recommended that drive A: always be a hard drive logical unit to avoid floppy disk access.

   b. It is recommended that several logical drives be assigned to different portions of a single hard drive in order to optimize the speed of the system.

   c. The HDINIT program will not allow you to assign two logical drives to the same area or overlapping areas of the hard disk. To redefine the characteristics of a logical drive, you first need to delete all logical drives which are assigned to the disk area you wish to use. Then you can define a logical drive for that area. It is not permissible to define two drive letters for the same floppy drive.

   d. You must return to the main menu where the options 0, 1 and 2 are displayed so that the drive configuration table will be written to disk.

8. Now it is time to boot the hard disk system so that files can be loaded onto it.

   a. If the entire disk is set aside for CP/M, lift the RESET switch. Hard disk CP/M becomes active in less than 5 seconds.

   b. If the disk is shared with TRSDOS or Xenix, press the BREAK key to exit HDINIT, then execute the program HDBOOT. The hard disk CP/M will become active within 15 seconds.

9. Execute the program HDCLEAR to erase the hard drive directories. This should be done once and only once after HDINIT option 2 is used to redefine drive characteristics. Since there are, at this point, no files on the hard drive, the HDCLEAR program must be brought into memory from a floppy drive. Designate the floppy drive with its drive letter. For instance, if the floppy drive 0 is CP/M logical drive E:, then enter the command E:HDCLEAR on the keyboard followed by the ENTER key. Answer the questions the HDCLEAR program asks in order to clear the directories of all logical drives assigned to the hard drive.

10. Now load the hard drive with whatever files you desire. A good starting point is to enter the command:

```
E:PIP  A: = E:*.*
```

If the floppy drive 0 is CP/M drive E: and hard disk is drive A:, this causes the system to load in the file transfer program PIP from floppy drive E: and copy all files from floppy to hard disk. After this command is complete, be sure to erase the following files from the hard disk so they won't be inadvertently executed (use the ERA command):

RSCPM.COM
AUTOEXEC.COM
SYSDEF.COM
SYSGEN.COM
COPY.COM
HDSYS
HDBOOT.COM
HDINIT.COM

These eight programs are valid only when the floppy disk CP/M is active and could cause serious problems if executed under hard disk CP/M.

11. If CP/M occupies the entire primary drive, it can be bootstrapped by simply lifting the RESET switch.

    If both TRSDOS or Xenix and CP/M are resident on the hard drive, CP/M must be bootstrapped via floppy disk. Boot up the floppy disk CP/M as described in step 3 above. Then enter the command HDBOOT followed by the ENTER key. Hard disk CP/M will be active within 15 seconds.

12. The programs HHSYSDEF, HDAUTO and HDCLEAR work correctly only when the hard disk CP/M is booted up. There is no need to copy HDSYS to the hard disk.

    The programs HDBOOT and HDINIT work correctly only when the floppy CP/M is booted up. HDINIT works correctly only for Level I (64K Unbanked) floppy CP/M and will generate false error messages if used with Level II (Memory Bank Switching) floppy CP/M. HDBOOT will work from Level I or Level II floppy CP/M.

13. The HDINIT program gives you the opportunity to declare additional bad tracks if necessary. The hard disks are usually error free. HDINIT will catch most bad tracks during the formatting process. On rare occasions a marginal track will not be caught during format but will give problems later on. The disk error message displayed on the status line (topmost line of the screen) tells you the cylinder and side numbers. You can then reformat the disk and lock out the track if the format routine doesn't catch it. If there is a BDOS error, additional information will be displayed on the status line immediately to the left of the clock in the form D: TT HS EE, where D is the drive letter, TT is the cylinder number in hexadecimal relative to the starting cylinder of CP/M, H is the head number, S is the sector number, and EE is the error code.

14. After running HDINIT to format and load the hard disk, and possibly redefining the drives, boot up the hard disk system before attempting to use PIP or FILEX to copy files to it.

It is necessary to reboot the system after running HDCLEAR so that it will synchronize itself with the cleared directory.

For those of you who have purchased OMNI, patching location 191H from 2 to 16 will allow ONI to access any of the 16 drive letters (A: through P:).

Note that the maximum cylinder number on the 12 meg drive is 229, while the 8 meg drive is 255.

IMPORTANT!!

Be sure to erase all files off the floppy diskettes before using FILEX to back up your hard drive onto floppies.

UTILITY PROGRAMS

The following new utility programs have been added. RSCPM will only function properly on the floppy based system. **DO NOT** copy the programs RSCPM, AUTOEXEC, SYSDEF, SYSGEN or COPY to the hard disk drives or attempt to execute them under the hard disk based CP/M. To do so may cause the loss of all CP/M files on the hard drive! These programs are for use only when the floppy based CP/M is booted up.

HDINIT — The hard disk initialization utility (HDINIT) provides three independent functions:

- Format hard disk area designated by user to be available for CP/M. Flawed sectors and bad tracks are automatically accommodated by this process.
- Load system code onto first cylinder of the CP/M area.
- Define disk allocation parameters such as number of directory entries, allocation block size and logical unit characteristics. Note that any change to drive parameters will make existing files on that drive inaccessible or unreliably accessible until the parameters are changed back. Follow instructions given on screen when program is executed.

Follow instructions on screen when program is executed.

HDBOOT — Used to bootstrap the hard disk CP/M if the disk is shared with TRSDOS or Xenix. Otherwise CP/M boots directly from hard disk.

HDCLEAR — Used to clear the directory if the number of directory entries are increased on a logical drive. Note that any change to drive parameters will make existing files on that drive inaccessible or unreliably accessible until the parameters are changed back. Follow instructions given on screen when program is executed.

HDAUTO — Allows user to specify a program or SUBMIT file to be executed whenever a cold or warm start occurs. Same function as AUTOEXEC except for hard disk CP/M while residing on hard disk.

HDSYSDEF — Allows modification of many system parameters. Same function as SYSDEF except for hard disk CP/M residing on hard disk.

HDCOPY — High speed copy of allocated data from one hard drive to another or from floppy to floppy. Drive characteristics must match for copying to occur. Also allows floppies to be formatted. Copies only currently allocated portion of disk or diskette.

FILEX — File transfer utility. Can be used to efficiently back up files larger than one diskette. Files are in standard CP/M format on diskette so they can be accessed in case of hard disk failure.

The command structure is the same as PIP with these exceptions:

- Only three option types (in square brackets) are supported:

  A — suppresses the segment check for files split across floppies.

  V — suppresses the read after write option.

  Gn — specifies the group number for both source and destination files regardless of where the G option is placed in the command lines.

The V option applies to the current and all following files until another V is sensed which toggles the V switch. All the wild card and implied file names (e.g., A:=B:TEST.COM) features of PIP are supported but file concatenation is not supported. The G option applies on all following command lines until another G option is specified. The A option suppresses FILEX use of f1'-f4' attributes for segment numbers until another A option is found. While the A option is in effect, the user is responsible for mounting the segmented disks in the proper order.

Operation is optimized for single drive operation by reading files from source drive until the available memory up to bottom of BDOS is filled, before addressing other drive for erasing existing files, writing files and possible readback check. Thus, if a wild card copy command is given, several files are read before switching to destination drive.

If the V option is not given, then after all data in memory is written (or all data that can be written on the output diskette) the byte by byte verify operation occurs for all data written. If a failure occurs, the bad file is identified by name with a message to the console, and copying continues.

If the directory or disk overflows on the destination diskette, the file is split into pieces. The operator is notified that the directory or disk has overflowed and after the verify operation has occurred on the destination drive, the operator is prompted for a new disk. The prompt includes the destination file name and segment number to be used on new disk to be mounted.

If the new disk contains the file to be copied onto it, but with the incorrect segment number, the operator is asked if he wishes to continue or mount different disk. As described below, FILEX will erase the output file (even if R/O) before copying the new file onto the disk, after the operator gives his permission to continue with a mismatched segment number.

The program writes a line containing the file name.type on the console for each file or file segment three times: once when it is read, once when written and once when verified, along with segment number and activity (READ, WRITE, VERIFY).

BDOS function calls are used for all disk and console activity. All console reads are done with BDOS function 10 so that the FILEX program may be used with XSUB. The destination = source specification may be made on the command line or several destination = source specifications may be made on command lines read by FILEX in a fashion similar to PIP. Unlike PIP, FILEX command line input will be terminated by either a blank line or a line whose first character is a / (hex 2F) as well as any line with a syntax error.

PIP copies the file to the destination drive using the file name and type $$$. After the copy is complete PIP erases any file on the destination disk with the same name as the source file, then renames the destination file with the $$$ type to the same name as the source file.

FILEX will erase any file on the destination disk with the same name as the source file before the copy begins. The file on the destination drive will then be created with the same name as the source file name and type.

IMPORTANT! Be sure to erase all files off the floppy diskettes before using FILEX to back up your hard drive onto floppies!