



RELEASE BULLETIN
819-095000-236 Rev 05

CP/M-86 Operating System

Model No: APC-S01

1.0 Introduction:

CP/M-86 is a single-user/single-task Disk Operating System (DOS) for the APC computer. The current release of the operating system consists of two integrated parts; CP/M-86 1.1 and CBIOS 1.106. Together these two parts form the operating system referred to as CP/M-86 1.1 (1.106:013).

2.0 Contents of the Release:

2.1 Distribution Media

PART NO.	DESCRIPTION
819-076001-0100 Rev 05	CP/M-86 Diskette
819-076002-0100	CP/M-86 Program Development Aids Diskette

2.2 Documentation

PART NO.	DESCRIPTION
819-000100-4001	CP/M-86 User's Guide
819-000102-2001	CP/M-86 System Guide
819-095000-236 Rev 05	Release Bulletin

3.0 Hardware/Software Requirements:

3.1 Minimum Hardware Requirements

APC-H01 - Monochrome APC with 1 Floppy Disk Drive (See Section 6.5 in this release bulletin)

3.2 Minimum Software Requirements

None

4.0 Installation Procedure:

- 1) Refer to the CP/M-86 User's Guide Chapter 1 for details on installation.

- 2) HDFORMAT must be performed before attempting CP/M-86 file related operations on the hard disk. Refer to the attached HDFORMAT Operating procedures for more details.

5.0 Enhancements:

- 1) Hard disk accessing has been added to the CP/M-86 1.1 BIOS. The hard disk logical unit letters are E: and F: for unit 0 (APC-H26) and G: and H: for unit 1 (APC-H27).
- 2) Console output performance has been increased by an average of 15% for character output not involving scrolling.
- 3) Track-to-Track Seek Time and Head Loading Time have been set to 4 milliseconds and 50 milliseconds respectively resulting in approximately a 10% overall increase in floppy disk performance.
- 4) Floppy Disk Read After Write (FDRAW)
 - A. FDRAW is not selected in this release of CP/M-86 1.1 (1.106:013)
 - B. FDRAW has been made user selectable by executing the CONFIG utility and selecting option 1 on the menu.
 - C. By not selecting FDRAW, Floppy Disk performance for write operations increases by approximately 200%.
- 5) Serial Communications is more reliable over a broader baud rate differential between a peripheral device and the APC due to changes in the SETCOM utility and the baud rate clock frequencies.
- 6) A configuration utility, CONFIG, has been added. Refer to the attached operation procedures for more information.
- 7) GSX (Graphic System Extension) for the APC monochrome and color systems has been added. An APC-H09, APC-H10, APC-H11, or APC-H12 graphics board is required to take full advantage of the GSX addition to the operating system. Refer to the GSX operation manual for more details.

6.0 Cautions:

- 1) Be sure to refer to the Hardware Reference Manual when setting jumpers for communications and printers.

- 2) I/O byte functionality has no effect in CBIOS 1.106:013 except for LST: assignment to LPT: or UL1:.
- 3) Use TIMEROFF and TIMERON utilities when running any communications software that supports interrupts.
- 4) Local stacks in user programs are recommended when BDOS calls are made since BDOS may change information on the system stack.
- 5) "PIP" in a single drive system does not function for file copying operations when a diskette change is necessary. PIP1 must be used for file copying operations on a single floppy-disk drive system. PIP1 does not support the hard disk drive. See the attached information for the operating procedures of PIP1.
- 6) Keyboard repeat does not work when the Timer is off.
- 7) The status of the GRAPH1, GRAPH2, CAPS and ALT keys are returned in the AH register for Direct CBIOS calls only. BDOS does not return their status to a calling routine. The user must write code that uses direct calls to the BIOS if the status of these keys is required.
- 8) The Spinwriter Model No 7730 has not been formally tested with this release of the Operating System.
- 9) Serial Interface Printers:
 - A. SETCOM allows the user to specify the parameters (baud rate, parity and number of data bits) for the standard APC serial RS232C port. These parameters must match those of the serial interface printer attached to the serial RS232C port.
 - B. After using the STAT or CONFIG utility to redirect the printer output to the serial RS232C port execute the SETCOM utility to set the matching parameters for the serial port before attempting printer-bound output.
- 10) Never press FNC/CTRL/BREAK-STOP while disk writes are in progress as it may cause loss of data.
- 11) TM-4 on the G9PFBU board (for printer control) must be jumpered in order to insure that a PC-8023 does not lose characters during printing. This setting for TM-4 is correct for all parallel interface printers specified for the APC.

- 12) HDIFORMAT must be performed prior to using the Hard disk for the first time with CP/M-86 1.1 (1.106:013). Refer to the attached operation instructions for HDIFORMAT.
- 13) PIP will not back-up a file to a floppy diskette from a hard disk when the file size is greater than the maximum available space on the destination floppy diskette. HDBACKUP must be performed and the entire hard disk partition containing the file must be backed-up to several floppy diskettes. HDBACKUP will restore the entire hard disk partition without regard to file name references. Refer to the attached HDBACKUP operation instructions.
- 14) HDBACKUP performs physical I/O to the floppy and hard disks without recognizing the standard CP/M-86 directory format or data storage conventions. Files backed-up by HDBACKUP are not accessible by the normal file I/O operations performed by CP/M-86 1.1.
- 15) CP/M-86 utilities provided with previously released versions of CP/M-86 1.1 for the APC should not be used on the current release of CP/M-86 1.1 (1.106:013). Use only those utilities that are provided with a particular release of CP/M-86 1.1 for that release.
- 16) The GSX enhancement to the operating system has not been formally tested at the time of this release; however applications have been successfully executing with the GSX enhancement.

7.0 Problems Fixed:

- 1) The COPYDISK utility no longer accepts keyboard inputs when data transfers to or from the floppy disks are occurring.

Operation of CONFIG

Purpose

CONFIG is a utility that allows the user to customize some of the hardware and software operating characteristics controlled by the BIOS (1.106:013 or later) of the CP/M-86 1.1 Disk Operating System. CONFIG is menu-driven and interacts with the user to define specific operating characteristics of the system. Any changes that are made during the configuration process may affect the performance of the applications and utilities, therefore it is suggested that the user should fully understand all of the changes that are possible and the effects that they have on the system.

Configuration Parameters

The following text describes each of the configuration changes that are possible with the current release of the CP/M-86 1.1 operating system and the `CONFIG` utility. Read these descriptions very carefully before attempting to change the `standard` release of the operating system. Selecting inappropriate configurations could cause loss of data or loss of access to peripheral devices attached to the APC system.

Figure 1 shows the main menu as it is displayed on the CRT screen of the APC. There are 5 categories of changes that are possible with the release of CONFIG Version 1.1. The 5 categories are described below.

FLoppy Disk Read After Write `FDRAW` Configuration

Selecting number 1 from the main menu results in a prompt in the miscellaneous prompting area of the main menu screen. The prompt requires either a `Y` for yes or `N` for no response. The prompt describes the current state of the FDRAW flag in the BIOS and the question is whether or not to change the current state of the `FDRAW` flag. An example of the prompt follows:

```
Now "non read after write" mode!  
Mode change? (Y/N): __
```

Responding with `Y` would change the mode to read after write. Responding with `N` would leave the current mode unchanged.

`FDRAW` dramatically affects the floppy disk Write performance and error checking aspects of the BIOS. By selecting Read After Write mode, the BIOS will automatically read the sector that was just written and check the CRC (Cyclic Redundancy Check) character for errors. In doing this Read After Write operation time is lost and performance related to write operations performed on the floppy disks goes down by approximately 200%. The gain obtained from this selection is the ability to catch single sector errors before the diskette information is totally

```
*****CP/M-86 Configuration Program Ver 1.1*****
*
*                               For APC                               *
*****
```

Configuration Menu

1. Floppy disk read after write configuration
2. List Device configuration
3. Available Disk Drive Selection
4. Update Memory Resident CP/M-86 1.1
5. Finish and Update Disk Resident CP/M-86 1.1

*Type the corresponding number (1-5): __

```
-----
| Miscellaneous   |
| Prompting area |
-----
```

Figure 1

destroyed by multiple bad writes. The user must decide to select better performance for writing to the floppy diskette or error detection at the single sector level. After a yes or no response is typed, the main menu is redisplayed.

List Device Configuration

Selecting number 2 from the main menu results in displaying a new menu as shown by figure 2. Two or three responses are necessary before you may return to the main menu by pressing the `ESC` key. The first response determines which port will be specified as the primary list output port. Either the parallel/centronix port or the serial RS232C port may be selected by typing a `P` or a `S` respectively at this prompt. The second response determines the number of data bits and parity convention used for the printer attached to the selected port. These must match the printer's requirements in order to produce legible output at the printer. Parity selection is only applicable if 7 bits of data are required. A third prompt will be issued to select the parity required by the printer. The third prompt for parity is displayed directly below the number of data bits prompt. A response of `E` selects even parity and responding with `O` selects odd parity.

The gridded area of numbers represents the code mapping table used by the BIOS to generate the output to the specified list device. The code map is used in specific cases when the output character code coming from the application generates a different symbol than one on a normal ascii-type printer for the same output code. When the code map is set up as a one-to-one map the incoming code is the same as the outgoing code to the printer. An example of setting the code table differently from the normal one-to-one map would be to allow the APC to interface directly to an EBCDIC type printer. The column and row values of the character map represent the least and most significant digits (4 bits per digit) of the incoming code. The 2-digit hexadecimal numbers at each column and row intersection are the output codes that are generated for the respective incoming codes.

The 4 cursor-control keys are used to provide non-destructive access to each of the values in the code map. After all of the modifications are made then the `ESC` key is pressed to return to the main menu.

Available Disk Drive Selection

The maximum configuration for the APC system is 4 floppy disk and 2 hard-disk drives. This results in an 8-drive logical-access arrangement. Floppy drives are accessible as logical drives A:, B:, C:, and D:. Hard disks are logically divided into 2 partitions each. When 2 hard disk units are attached (APC-H26, APC-H27), the 4 logical hard disk drives are references as E:, F:, G:, and H:.

```

* LIST DEVICE CONFIGURATION *
* Parallel(P) or Serial(S) Interface? __
* Length = 7 bits/8 bits ? (7/8):

```

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│ Parity Select message area │
└───────────────────────────────────────────────────────────────────────────────────┘

```

```

Length = 7 bits, Even parity
(See note 1)

```

```

  0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
0 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
1 10 11 12 13 14
2
3
4
5
6           Remaining Code
7           Map Values
8
9
A
B
C
D
E
F F0 F1 -----FF

```

```

* OPERATION GUIDE*

```

```

* Move Cursor
  (← → ↑ ↓ )

```

```

* Modify Code
  (Ø-F)

```

```

* Return to Menu
  (ESC)

```

```

Note 1: This display changes according to the selected parameters

```

FIGURE 2

Selecting number 3 from the main menu displays the menu shown in figure 3.

It is very important to select the configuration of the drives that exactly matches the hardware configuration of your APC system. If drives are indicated as available and they are physically not available then an endless "disk-not-ready" error message sequence will be displayed by the operating system when access is attempted on the non-existent drive. The APC system will have to be "re-booted" before recovery is possible from selecting a non-existent drive. This error condition will not occur if the drive configuration exactly matches the hardware configuration.

To return to the main menu, press the `ESC` key. The configuration indicated on the screen will be used to configure the disk resident image of CP/M-86 1.1 (see main menu selection number 5). Configuration of the CP/M-86 memory resident image relative to drive selections is not allowed by CONFIG. The newly configured CPM.SYS file must be "booted" in order to set the new drive selections.

Update Memory Resident CP/M-86 1.1

Selecting number 4 from the main menu will automatically update the currently loaded version of CP/M-86 1.1 that is resident in memory. Any updates from the current session of CONFIG, with the exception of Disk selection, will be automatically transferred to the resident memory image of the operating system. These updates are in effect until CP/M-86 is "rebooted" from disk or a new configuration is loaded. A confirmation message is displayed in the miscellaneous prompting area of the main menu display after the updated configuration is loaded into the resident memory image of CP/M-86 1.1.

Finish and Update Disk Resident CP/M-86 1.1

If the new configuration is to be a permanent change to the CPM.SYS file, then select number 5 from the main menu and respond with `Y` to the prompt:

Update A:CPM.SYS FILE? (Y/N): __

Note: This prompt will change according to the drive you are currently using.

Responding with "N" will allow you to exit CONFIG without updating the disk resident image.

Responding with "Y" causes the old disk resident image of CPM.SYS to be renamed to CPM.SAV and the updated CP/M-86 1.1 will be written to the CPM.SYS file.

If the disk already contains a file named CPM.SAV then another prompt is displayed in the miscellaneous prompting area of the

CURRENT
DISK SELECTIONS

FLOPPY DISK
SELECTION

A B C D
Y-Y-Y-Y

HARD DISK
SELECTION

E F G H
Y-Y-Y-Y

Use cursor control keys {← or →} to move the cursor below the drive selections.

Once the cursor is positioned, type {Y} or {N} to indicate if the drive is available or not.

Press the {ESC} key to return to the main menu.

FIGURE 3

main menu display:

A:CPM.SAV has already existed!

ERASE: A:CPM.SAV file? (Y/N):__

*Note this message will automatically change
to reflect the current drive reference.*

Responding with `Y` will cause the old CPM.SAV file to be erased,
the current CPM.SYS file to be renamed to CPM.SAV and then the
updated CP/M-86 1.1 will be written to disk and have the file
name CPM.SYS. Responding with `N` will allow you to simply exit
and no changes will be made to the files on the disk.

Operation of PIP1

PIP1 is a utility that allows single and multiple files to be transferred from one diskette to another, when it is necessary to back up files on a single-drive APC system. Drive specifications are unnecessary, since drive A: is always used. The drive specification will not be accepted by PIP1 and a syntax error will result if a drive specification is included. Wildcard characters operate the same as they do in PIP, and all file specifications are padded to the right with spaces, if less than 8 characters for the file name, or less than 3 characters for the file type are specified. If multiple files are to be copied, then the destination must always be *.* or ???????.??? (totally ambiguous) and no renaming is possible. The examples below will illustrate what happens for different commands when using PIP1.

<u>COMMAND</u>	<u>RESULT</u>
.	= *.* Full disk copy of all files
*CMD	= *.CMD Syntax error:
*.CMD	= *.CMD Syntax error:
.	= *.CMD All .CMD files are copied.
CPM.SYS	= CPM.SYS Only CPM.SYS is copied.
CPM.OLD	= CPM.SYS CPM.SYS is copied into CPM.OLD
.	= CPM.SYS Syntax error:
*	= File1 Syntax error:
.	= File1.* All files with name File 1 are copied.
.	= FIL*1.*CPM All files beginning with FIL are copied.
.	= FIL*.CP* All files beginning with FIL and ending with .CP are copied.
A: *.*	= A:*.SYS Syntax error:
.	= ABC???.??? All six letter files beginning with ABC are copied.

PIP1 does not allow multiple command entries on the same line of input, and only one command may be processed in one PIP1 cycle. PIP1 is always activated by typing PIP1 <space> command <CR> at the A> prompt display of the system. In order to issue a new command to PIP1, you must exit PIP1 and type a new command line from the A> prompt.

Source and Destination Diskettes

PIP1 marks the source diskette and the destination diskette with directory entries containing no extents (0 records used). The source diskette is marked by the filename SSSSSSSS.SSS and the destination is marked by the filename DDDDDDDD.DDD. When all operations are complete, these two identification files are deleted from the directory of the diskettes. Sometimes, it may be necessary to ABORT a PIP1 operation, and the identification files may remain on either the source or destination diskettes.

These files may be erased by using the ERA command provided by CP/M-86. The identification files are opened on the diskette in order to protect the user from inadvertently mixing up the source and destination diskettes. This identification method prohibits the copying of files from a diskette to itself, or from more than one source to a destination. Copying to multiple destinations is allowed as long as the destination does not change during the transfer of one file. Once the transfer is complete on a file, a new destination may be used.

PIPl Messages

There are three message types that are displayed by PIPl:

1. Banner Message
2. Operational Messages
3. Error Messages

Banner Message

The banner message displays the program name "PIPl" and the version number being used. The following is an example of the banner message:

```
PIPl Version 1.0
```

Operational Messages

An operational message may request a user action or display information related to the current activity of PIPl. Examples of these messages are given below:

```
TRANSFERRING  
- Filename -
```

```
TRANSFER COMPLETE  
- Filename -
```

```
INSERT SOURCE DISKETTE INTO DRIVE A  
PRESS RETURN TO CONTINUE
```

```
INSERT DESTINATION DISKETTE INTO DRIVE A  
PRESS RETURN TO CONTINUE
```

```
A (ABORT) or R (RETRY) ?
```

```
A (AGAIN) or E (END) ?
```

Error Messages

Error Messages inform the user of possible errors, either in the sequencing of the source and destination diskettes, or a problem with space allocation on the destination media. Examples and definitions of possible error messages are given below:

SYNTAX ERROR IN COMMAND LINE

- The command line was typed incorrectly. Possibly, illegal characters were used or the destination file specification did not match the source file specification.

SOURCE FILE NOT FOUND

- When a source diskette is inserted and a file copy operation has not ended, the directory on the diskette is scanned for the SSSSSSSS.SSS identification file and the file name being transferred. If the file being transferred is not located in the directory then this message will be displayed followed by the "A(ABORT) or R(RETRY)?" message. Normally this error is encountered when the incorrect source diskette is inserted. If retry is selected then the correct source diskette can be inserted and the operation continues. Sometimes the information on the diskette is destroyed from wear or mishandling of the diskette. When the source file is not found and there is a physical problem with the media, the only recourse is to ABORT.

DESTINATION FILE NOT FOUND

- When a destination diskette is inserted and a file copy operation has not ended, the directory on the diskette is scanned for the DDDDDDDD.DDD identification file and the filename being transferred (Type .\$\$\$). If the file being transferred is not located after the DDDDDDDD.DDD file has been found then this error message will be displayed followed by the "A(ABORT) or R(RETRY)?" message. Normally this error is encountered when the incorrect destination diskette is inserted but has the proper identification. It may also occur if the information on the diskette has been destroyed by wear or mishandling of the diskette. If Retry is selected then the correct destination diskette can be inserted and the operation continues. When the destination file is not found and there is a physical problem with the media the only recourse is to ABORT.

NOT ENOUGH SPACE

- This error message is displayed for one of two reasons:
 1. No remaining directory space:

All possible directory entries are taken and the file cannot be opened.
 2. No remaining extents:

All extents on the diskette have been allocated to existing files.

This error returns the system to the A> prompt. Only the last extent of the last file being transferred is lost. It is necessary to ERASE (ERA) the SSSSSSSS.SSS, DDDDDDDD.DDD and *.\$\$\$ files from the source and destination diskettes before another transfer is attempted after encountering this error.

INCORRECT SOURCE DISKETTE

- A diskette without the SSSSSSSS.SSS identification file was inserted. Simply insert the correct source diskette and continue.

INCORRECT DESTINATION DISKETTE

- A diskette without the DDDDDDDD.DDD identification file was inserted. Simply insert the correct destination diskette and continue.

A (ABORT) OR R (RETRY)?

- If ABORT is selected, a direct return to the system A> is effected, and the SSSSSSSS.SSS file will not be erased.
- If the file transfer was not complete, then the DDDDDDDD.DDD file will not be erased on the destination diskette.
- The last file transferred will be complete and correct; however, any *.\$\$\$ files must be deleted when ABORT is selected, since they will be missing extents.
- ABORT should not be selected unless there is no way to recover by using the RETRY option.
- If you always keep track of your source and destination diskettes, this message will not occur unless there is a physical problem with the information on the diskette.

Type Ahead

The only keys that are recognized by PIP1 are <RETURN>, R, A, and E. All other keys are not recognized. If a <RETURN> is typed ahead of its request, only one <RETURN> is accepted from the system input buffer, and all others are discarded. Typing ahead in most cases causes an error message to be displayed, but recovery is allowed, by electing to RETRY or by inserting the correct diskette and then pressing <RETURN>.

Character Set

The following is a list of the allowable characters for the file specifications; all others are disallowed:

*, ?, \$, #, @, !, &, %, 0 thru 9, A thru Z

Any characters that are used and not listed above, will cause a syntax error in the command line.

AGAIN or END

After the last file is transferred and the identification files are erased, PIP1 prompts with:

A (AGAIN) or E (END) ?

Typing `A` causes PIP1 to execute the same sequence once again. A new command line may not be entered at this time. A new source diskette and/or destination diskette may be used for this pass through PIP1. This allows multiple sources (maybe different files) to be transferred to different destination diskettes. Typing `E` causes PIP1 to exit to the A> prompt of CP/M-86.

General Notes

PIP1 will work on multiple-drive APC systems, but drive A is the only one used. PIP1 is not intended to replace PIP, since limited functionality is supported by PIP1. PIP must be used to convert, verify and concatenate files. PIP1 must be used when a single drive, single-file, or multiple-files copy operation is desired, and a diskette change is necessary during the copying phase. The SSSSSSSS.SSS and DDDDDDDD.DDD and type.SSS filenames are reserved for exclusive use of PIP1. These filenames should not be used for any files created by the user or undesirable transfers may result in lost information.

GH/jf

Purpose of HDBACKUP

HDBACKUP is a utility for saving to diskette (backing-up) the contents of the APC's 10 megabyte hard disks (APC-H26 and APC-H27). The utility is also used for loading from diskette (restoring) data previously saved. HDBACKUP allows saving or restoring of any one of the logical drives associated with each disk unit - E or F of the APC-H26, and G or H of the APC-H27.

HDBACKUP requires the use of dual-sided, double-density diskettes, with a format of 26 sectors per track. Any of the APC's diskette drives may be used when saving or restoring data with HDBACKUP. Because the capacity of each hard disk drive is several times larger than the capacity of a diskette, five diskettes are required to perform a backup of a hard disk drive. During a save operation, HDBACKUP places a serial number on each diskette. This ensures that a subsequent load operation using these diskettes will not be finished until all data has been restored. Note that the data saved on the diskettes cannot be accessed or used except to be restored or verified by HDBACKUP.

Operation of HDBACKUP

Initiate HDBACKUP by typing the program name and a carriage return at the CP/M-86 command entry prompt. Entries can be made in either uppercase or lowercase. After the program is initiated, the following display appears, prompting for entry of an operation specifier:

```
**** Full Hard Disk Back Up V.1.1 (CP/M) ****
```

```
** Save All/Load All [S,L] ? : _
```

Enter S or s to save (backup) data from hard disk to diskette. To load (restore) data from diskette to hard disk, enter L or l. After entry of either operation specifier, the following prompt appears:

```
** Copy or Verify or Copy & Verify [C,V,B] ? : _
```

Enter C or c to copy data to or from hard disk. Enter V or v to verify the contents of a hard disk with data previously saved to diskette. Enter B or b to copy data to or from hard disk, and verify that the copied data is correct.

HDBACKUP then prompts for the hard disk drive being used. During the program, the brackets contain the names of all logical hard disk drives available - either [E,F], or [E,F,G,H], depending on system configuration.

```
** Which hard disk drive : [available hard disk drives] ? :
```

Enter the hard disk drive name being backed-up or restored. The program then prompts for the diskette drive being used. Available diskette drives - either [A,B], or [A,B,C,D] - appear in brackets during the program.

** Please insert a floppy disk
and indicate the floppy disk : [available diskette drives] ?

Insert a diskette in an available drive, then enter the name of the diskette drive being used. A confirmation display then appears, providing information about the operation selected.

For a save operation, the display appears as follows with the appropriate values appearing in brackets and d1 and d2 representing drive names:

Hard disk track size : [hhh] (Decimal)
Hard disk end cylinder : [ccc] (Decimal)
05 floppies are needed to save data from hard disk d1:
Current floppy in use : ff
Total number of floppy disk needed : 05
Back-up date : DAY mm/dd/'yy Time

Copying hard disk d1: to floppy disk d2:
Is this what you want to do [Y/N] ? : _

For a load operation, the display appears as follows with the appropriate values appearing in brackets and d1 and d2 representing drive names:

Hard disk track size : [hhh] (Decimal)
Hard disk end cylinder : [ccc] (Decimal)
Floppy disk track size : [ddd] (Decimal)
Current floppy disk serial no. : [nn] (Decimal)
Current floppy in use : ff
Total number of floppy disk needed : 05
Back-up date : DAY mm/dd/'yy Time

Copying floppy disk d1: to hard disk d2:
Is this what you want to do [Y/N] ? : _

At this point, to cancel a save or load operation and return to the operation specifier prompt, enter N or n. Otherwise, to continue with the operation selected, enter Y or y.

While HDBACKUP is copying data, the screen displays the following, with ccc representing the cylinder number presently being copied.

```
** Copy started
Current hard disk cylinder [ccc] (Decimal)
Current floppy disk cylinder [ccc] (Decimal)
```

During verification, the screen displays the cylinders being checked as follows:

```
** Verify started
Current hard disk cylinder [ccc] (Decimal)
Current floppy disk cylinder [ccc] (Decimal)
```

Because five diskettes are required to backup a single hard disk drive, HDBACKUP pauses at several points during a save or load operation to allow the diskette to be changed. During a save, this occurs when the diskette being copied to is filled. When performing a load operation, the diskette must be changed when all data has been read from it.

During a save or load operation, the following prompt appears to indicate that the diskette needs to be changed. HDBACKUP displays the names of all available diskette drives in brackets.

Operations on floppy disk d: have been completed.

```
** Please insert a floppy disk
and indicate the floppy disk : [available diskette drives] ?
```

In response to the prompt, remove the previous diskette, insert another diskette in one of the available drives, and enter the name of that drive. Note that the drive specified does not have to be the same one used for the previous diskette.

In response to inserting a new diskette and entering a drive name, HDBACKUP displays information about the diskette in use and the operation being performed. A confirmation prompt requires entry of Y or y to continue the operation as specified, N or n to change the entries. When the operation is completed, the following prompt appears.

```
** Back-up has completed. **
Again ? [Y/N] ? : _
```

Enter Y or y to return to the operation specifier prompt. Otherwise, to end HDBACKUP, enter N or n.

Error Messages and Conditions

The following describe the various error messages that may appear during HDBACKUP and the conditions they represent. Some error messages appear with the following prompt:

[I : Ignore, R : Retry, A : Abort]

Enter I to continue the operation despite the error. This may, however, result in defective data being copied. Enter R to try to read or write the data again. Entering A aborts the operation and returns to the operation specifier prompt.

*** Hard Disk is Not Available ***

This message appears and the program ends if the hard disk is not (properly) attached, if the power to the disk is not on, or if an improper version of CP/M-86 is being used. Make sure that power to the hard disk is on and that all cables are securely attached. Also make sure that the correct version of CP/M-86 is being used. If the message persists, contact your APC dealer.

=====
** Floppy disk d: is not ready.

This message appears if a diskette drive name is specified before the diskette is inserted, or before the diskette is properly seated in the drive. Make sure the diskette is in the drive and the drive door is closed before continuing.

=====
*** Size Check Error ***

[I : Ignore, R : Retry, A : Abort] : _

This message appears during a load operation if the amount of data to be recovered from diskette exceeds the size of the hard disk drive onto which it is being copied. Press R or r to retry. If the message reappears, make sure that the hard disk drive specified for recovery is the one from which the data was originally saved. If not, press A or a to abort, then begin the operation again with the appropriate drive specifier. If the drive specification is correct and the message persists, contact your APC dealer. Note that pressing I or i continues with the operation despite the error and is not advised.

=====

*** Fatal Error. Zero Cylinder is Bad. ***
*** Abnormal End ***

This message appears and the program ends if either the diskette or the hard disk drive being used contains a cylinder 0 that is defective. Initiate HDBACKUP again and try the operation again. If the message persists, contact your APC dealer.

=====
*** Hard Disk H/W Error ***
* Cylinder [ccc]
* Track [tt]
[I : Ignore, R : Retry, A : Abort] : _

This message appears when the error map of the hard disk cannot be read, or when an error that is not listed in the hard disk error map is encountered. When the message is displayed, the actual cylinder and track numbers appear in brackets. Press R or r to retry the operation. If the message reappears, press A or a to abort the operation. Restart HDBACKUP and try the operation again. If the message persists, contact your APC dealer. Note that pressing I or i to ignore the error may result in defective data being copied to the hard disk.

=====
*** Floppy Disk H/W Error ***
* Cylinder [ccc]
* Track [tt]
** Please Change Floppy Disk **

This message appears during a save operation if a defective area of the diskette is encountered. Replace the diskette and repeat the operation.

=====
*** Floppy Disk H/W Error ***
* Cylinder [ccc]
* Track [tt]
[I : Ignore, R : Retry, A : Abort] : _

This message and prompt appear during a load operation if a defective area of the diskette is encountered. Respond to the message as described above for a Hard Disk H/W error..

=====
This floppy has already been loaded.

This message appears during a load operation to indicate that the data on the diskette inserted in the drive has already been restored to the hard disk. Remove the diskette and insert one that has not yet been restored to hard disk.

Purpose of HDFORMAT

HDFORMAT is a utility that allows formatting under CP/M-86 of the APC's 10 megabyte hard disks (APC-H26 or APC-H27). The utility allows formatting of one or both of the logical drive divisions of each hard disk. The APC-H26 is segmented into logical drives E and F; the APC-H27 is segmented into logical drives G and H.

Each hard disk is formatted to contain the following physical address structure:

- o 26 sectors per track
- o 8 tracks per cylinder
- o 181 cylinders per disk (179 available for data)

When errors are detected during formatting, the utility initiates seven retry attempts to format the track. Any bad track addresses found during formatted are logically reallocated to the next available track. HDFORMAT creates an error map at cylinder 0, track 2, sector 0 to control this reallocation and correct logical address access. Note that prior to formatting, the disk may contain a permissible number of tracks already identified by the factory prior to shipment as "permament bad tracks." Permament bad tracks are identified as such in the address identification section of the track and are logically inaccessible.

Operation of HDFORMAT

Initiate HDFORMAT by typing the program name and a carriage return at the CP/M-86 command entry prompt. Entries can be made in either uppercase or lowercase. After the program is initiated, the following display appears, prompting for entry of a drive specifier:

```
*** HARD DISK FORMATTER V1.1 (CP/M) ***  
FORMAT DRIVE : _
```

The program may be ended at the drive specifier prompt by typing a Control-C (hold down the CTRL and C keys). Otherwise, any one of the following entries is possible in response to the drive specifier prompt:

<u>Entry</u>	<u>Program Action</u>
0	Logical drives E and F of the APC-H26 disk will be formatted.
1	Logical drives G and H of the APC-H27 disk will be formatted.
E	Logical drive E of the APC-H26 disk will be formatted.
F	Logical drive F of the APC-H26 disk will be formatted.
G	Logical drive G of the APC-H27 disk will be formatted.
H	Logical drive H of the APC-H27 disk will be formatted.

If a 0 or 1 is entered, the following message appears with u representing the 0 or 1 and d1 and d2 representing E and F or G and H.:

```
*HARD DISK UNIT u CONSISTS OF DRIVE d1:,d2:
```

After entry of the drive specifier, the following prompt appears requiring confirmation or rejection of the drive selection:

```
READY [Y:YES N:NO] :_
```

If N or n is entered, the prompt for drive specifier is redisplayed. Entry of Y or y immediately initiates the format operation. During formatting, the screen displays the following, with nnn representing the cylinder number (0-180) presently being formatted. The appropriate drive or unit number appears in parentheses.

```
*FORMATTING CYLINDER NO. [nnn]
```

If a bad track or a permanent bad track is encountered during formatting, the cylinder and track numbers (represented below by ccc and tt) are reported on the screen as follows. Note that an asterisk before the address information denotes a permanent bad track identified by the factory.

```
*** BAD TRACK INFORMATION (drive or unit number) ***
P[CCCTT]          P="*" : PERMANENT BAD TRACK
                  CCC=CYLINDER NO.
                  TT=TRACK NO.
```

```
[ccctt] *[ccctt] [ccctt]
```

If no bad tracks are encountered, the following appears:

```
*** BAD TRACK INFORMATION (drive or unit number) ***
NO BAD TRACK
```

When formatting is completed, the following prompt appears:

```
*NORMAL END
[A:AGAIN E:END] : _
```

To continue formatting hard disk drives or units, enter A or a. The program then redisplay the drive specifier prompt. If an E or e is entered, the following appears on the screen:

```
PLEASE REBOOT SYSTEM
ENTER FNC-CTR-BREAK
```

Hold down the FNC, CTRL, and BREAK/STOP keys to reboot the system.

Error Messages and conditions

The following describe the various error messages that may appear during HDFORMAT and the conditions they represent. If the prompt [R:RETRY A:ABORT] is displayed with an error message, enter R or r to retry formatting the cylinder. When A or a is entered to abort the format attempt, the message *ABNORMAL END appears with the prompt [A:AGAIN E:END]. Follow the procedure described above for normal end to continue or end HDFORMAT.

*NO HARD DISK SYSTEM
*END OF FORMAT PROGRAM

This message appears and the program ends if the drive or unit number entered at the drive specifier prompt is not defined in the CP/M-86 Basic Input/Output System (BIOS). This message suggests an inappropriate version of CP/M-86 is being used.

=====
*OUT OF CYLINDER
PLEASE CHECK HARD DISK DEFINITION TABLE

This message appears when no more tracks are available for bad track reallocation. If this message appears, try reformatting the drive. If the message continues to appear, contact your APC dealer.

=====
*DRIVE d: NOT READY
THIS DRIVE EXISTS IN HARD DISK UNIT u
PLEASE SET HARD DISK UNIT TO READY CONDITION
[R:RETRY A:ABORT] : _

This message and prompt appear when a logical drive (E,F,G,H) is specified for formatting but is not ready or is not attached. The drive number is represented by d: above. Check the cables and power switch to make sure the drive unit (represented by u above) is ready. Enter R or r to retry formatting the drive; abort the format attempt by entering A or a.

=====
*HARD DISK UNIT u NOT READY
PLEASE SET HARD DISK UNIT TO READY CONDITION
[R:RETRY A:ABORT] : _

Same as above but when disk unit (0 or 1) specified for formatting is not ready.

=====

If one of the following messages appears during an attempt to format a single logical drive, it is necessary to format the entire disk unit in which the drive specified (d:) is located.

*NO FORMATTING DISK ON DRIVE d:

*ERROR MAP READ ERROR ON DRIVE d:

*NOT CP/M FORMAT ON DRIVE d:

The following message also appears when any of the three messages above is displayed. The letter "u" represents the disk unit that requires formatting.

NEED FULL FORMATTING HARD DISK UNIT u

```
=====
*FATAL ERROR
  ERROR MAP TRACK IS BAD ON HARD DISK UNIT u
*ABNORMAL END
  [A:AGAIN E:END] : _
```

This message and prompt appear if the track on which the error map is located (cylinder 0, track 2) is bad. Try reformatting the drive. If the message reappears, contact your APC dealer.

```
=====
*DISK HW ERROR IN [ccc] CYLINDER ON (drive or unit number)
  [R:RETRY A:ABORT] : _
```

This message and prompt appear if an error (seek, write, etc.) occurs when the cylinder (ccc) is being accessed. Press R or r to try to access the cylinder at which the error is reported. If the message reappears, press A or a to abort the program. Retart HDFORMAT from the beginning. If the message reappears, contact your APC dealer.

```
=====
*DISK HW ERROR IN ERROR MAP WRITING ON (drive or unit number)
  [R:RETRY A:ABORT] : _
```

This message appears if an error occurs when the error map is being written. Press R or r to try to write to the error map again. If the message reappears, press A or a to abort the program. Retart HDFORMAT from the beginning. If the message reappears, contact your APC dealer.

```
=====
```

*DISK HW ERROR ? ON (drive or unit number)
[R:RETRY A:ABORT] : _

This message represents an undefined error. This occurs if, for example, the power to the hard disk is turned off during formatting. Make sure power to the hard disk is on and that all cables are connected securely. Try to reformat the disk. If the message persists, contact your APC dealer.
