

# CP/M Plus

John R Hudson

1992

## 1 All systems go

Most people who have heard of CP/M know of it as the first important operating system for microcomputers. But those who have never used a 6128 or a PCW know it in version 2.2. Version 3 — or CP/M Plus — was hardly taken up until Amstrad supplied it with the CPC6128 and PCW8256 in 1985. CP/M Plus is one of the best operating systems for microcomputers. It was a vast improvement on version 2.2 with features which make it unique among microcomputer operating systems.

The need for a standard ‘Disc Operating System’ (or DOS) arose when removable (or ‘floppy’) discs became available for microcomputers. People wanted to be able to distribute software on discs which would run on any machine. CP/M offered a way of doing this and also made it easier to connect printers, modems and other peripherals to the computer.

As CP/M was developed, more features were added to the ‘disc operating system’ part of CP/M. I will try to explain what they do and why, in some cases, they make CP/M a better disc operating system. If you have a 6128 Plus, load CP/M from your system disc (your backup, not the original!) and enter

```
DIR [full]
```

Something like Figure 1 should appear. CPC 6128 owners will get a slightly different list. After the size of each file in bytes and the number of records, there are always two ‘attributes’, normally ‘Dir’ and ‘RW’.

‘RW’ stands for ‘Read/Write’ which means that anyone can do anything with the file, including deleting it. You will know from the instructions that come with blank discs that you can ‘Write Protect’ the whole disc so that files can be read but not changed or deleted. However, this mechanism applies to all files on the disc. CP/M allows you to make a single file ‘Read Only’ and the ‘RW’ attribute becomes ‘RO’ (Figure 2).

If you have Mini-Office II, put the disc in drive B: if you have two disc drives, or keep it handy if not, and enter

```
DIR B: [full]
```

If you have one drive, swap the discs when you are asked to put in the disc for drive B: and then press a key. You should see something like Figure 2. Don’t worry if it is not exactly the same; there are different versions of Mini-Office II. All but two files have ‘Sys’ instead of ‘Dir’ and all have ‘RO’ instead of ‘RW’. The two files with ‘Dir’ are the files you see if you use the normal AMSDOS command ‘CAT’ (for ‘Catalogue’) at the BASIC prompt. AMSDOS displays

```
CONVERT BAS* 1K OFFICE BAS* 1K
OK free
```

```

Scanning Directory...
Sorting Directory...
Directory For Drive A: User 0

```

Name	Bytes	Recs	Attributes	Name	Bytes	Recs	Attributes
AMSDOS	COM	1k	8 Dir RW	BANKMAN	BAS	1k	7 Dir RW
BANKMAN	BIN	2k	12 Dir RW	C10CPM3	EMS	25k	200 Dir RW
DATE	COM	3k	23 Dir RW	DEVICE	COM	8k	58 Dir RW
DIR	COM	15k	114 Dir RW	DISCKIT	COM	6k	48 Dir RW
ED	COM	10k	73 Dir RW	ERASE	COM	4k	29 Dir RW
GET	COM	7k	51 Dir RW	KEYS	CCP	1k	3 Dir RW
KEYS	WP	1k	3 Dir RW	LANGUAGE	COM	1k	8 Dir RW
PALETTE	COM	1k	8 Dir RW	PIP	COM	9k	68 Dir RW
PROFILE	FR	1k	1 Dir RW	PROFILE	SP	1k	1 Dir RW
PROFILE	UK	1k	1 Dir RW	PUT	COM	7k	55 Dir RW
RENAME	COM	3k	23 Dir RW	SET	COM	11k	81 Dir RW
SET24X80	COM	1k	8 Dir RW	SETDEF	COM	4k	32 Dir RW
SETKEYS	COM	2k	16 Dir RW	SETLST	COM	2k	16 Dir RW
SETSIO	COM	2k	16 Dir RW	SHOW	COM	9k	66 Dir RW
SUBMIT	COM	6k	42 Dir RW	TYPE	COM	3k	24 Dir RW

```

Total Bytes      = 148k  Total Records =   1095  Files Found =   30
Total 1k Blocks = 148  Used/Max Dir Entries For Drive A:  31/ 64

```

Figure 1: Screen response to DIR [full]

```

Directory For Drive B: User 0

```

Name	Bytes	Recs	Attributes	Name	Bytes	Recs	Attributes
BOOT	BAS	1k	5 Sys RO	COMM5C	M02	22k	170 Sys RO
COMMSD	M02	6k	48 Sys RO	CONBOOT	BIN	2k	9 Sys RO
CONMEN2	BIN	1k	8 Sys RO	CONMENU	BIN	1k	8 Sys RO
CONVERT	BAS	1k	4 Dir RO	DBC0N	BAS	4k	32 Sys RO
INTERCPT	BIN	1k	3 Sys RO	KNIFE	BIN	5k	40 Sys RO
KOHLRABI	BAS	90k	720 Sys RO	MEN	BIN	3k	17 Sys RO
OFFICE	BAS	1k	2 Dir RO	SPRCON	BAS	4k	25 Sys RO
STAMP	BAS	7k	56 Sys RO	WORDA	BAS	6k	48 Sys RO
WORDB	BAS	22k	170 Sys RO	WORDCON	BAS	1k	8 Sys RO

```

Total Bytes      = 178k  Total Records =   1373  Files Found =   18
Total 1k Blocks = 178  Used/Max Dir Entries For Drive B:  25/ 64

```

Figure 2: Mini-Office II disc directory

acknowledging they are ‘Read Only’ files by adding the asterisks. To explain ‘OK free’ and ‘Sys’ a bit of history is needed.

In the era BA (Before Amstrad) when computers and disc drives were really expensive and there were no high capacity disc drives, the only way of increasing capacity was to add more floppy disc drives. So CP/M was developed to allow it to use up to 16 disc drives labelled A: to P:. With all this money invested in disc drives, people wanted them to be accessible to more than one person. So Digital Research, the company responsible for CP/M, came up with MP/M — a multi-user version of CP/M — through which 16 users could share a single processor and up to 16 disc drives. Each user was allocated a ‘user area number’ between 0 and 15 which gave the user access to all the files in this ‘user area’ on all the disc drives and to programs in the ‘system area’. MP/M never caught on but the concepts of ‘user areas’ and a ‘system area’ were built into CP/M.

In fact, there are no such ‘areas’ on the disc; files belonging to a particular ‘user area’ are identified by the ‘user number’ which is put in front of the filename in the place where CP/M looks to see if a file has been deleted. Deleted files have the number ‘225’ in this position. So when CP/M is looking for files on a disc, it only looks for those with the current ‘user number’. If you are in user area 3, for example, only files with user number 3 are displayed in response to the CP/M command ‘DIR’ (for ‘Directory’).

Large computers have one or more ‘system operators’ who keep an eye on the ‘system area’, loading programs or languages as they are needed for different jobs. Digital Research incorporated the idea of a ‘system area’ into MP/M. As with the user areas, there is no such ‘area’ on the disc, merely an attribute to a filename. A program in user area 0 with the ‘Sys’ (for ‘System’) attribute can be used by any of the sixteen users without it having to be in their user area. So when you ask MP/M or CP/M Plus to run a program, it first looks for that program with the current user number and, if it doesn’t find it, looks for a file of the same name with user number 0 and the ‘Sys’ attribute. It ignores files with user number 0 and the ‘Dir’ attribute unless the user is in user area 0.

If you use DIR to list files in user area 0 and there are files in the system area, CP/M Plus adds the message **SYSTEM FILES EXIST** at the end of its response to DIR. If you then use DIRS (for ‘Directory of System Files’), you can see which these are. Neither CP/M version 2.2 nor AMSDOS have an equivalent command but AMSDOS knows the ‘Sys’ files are there and includes them in its calculation of free space — hence the ‘OK free’ message in the case of Mini-Office II.

**WARNING:** ‘Sys’ files have nothing to do with ‘system discs’ or ‘system formats’. You can have ‘Sys’ files on a data format disc.

So what use is all this? Well, anyone with a hard disc will know that a display of 1024 filenames isn’t the easiest list to search. So early hard-disc systems — such as the ICE for the Apple II — used CP/M disc drive labels to ‘partition’ the disc and make filing operations easier.

However, other operating systems — such as MS-DOS and UNIX — have adopted a tree structure with a ‘root’ directory, sub-directories, sub-sub-directories, sub-sub-sub-directories and so on (Figure 3). Theoretically this offers users more possibilities for ‘grouping’ files than CP/M but there are two disadvantages to a tree structure. Firstly, it encourages people to group files around programs rather than around activities and, secondly, it makes copying files between ‘groups’ more difficult.

For example, to move data from a spreadsheet or a database in one sub-directory to a report in another sub-directory involves a detailed knowledge of the tree structure, or ‘directory paths’,

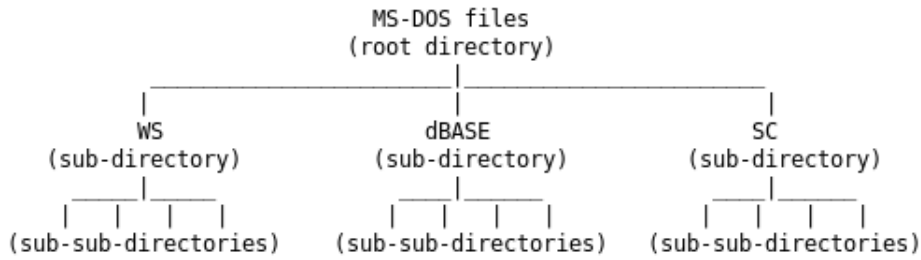


Figure 3: Possible MS-DOS tree structure

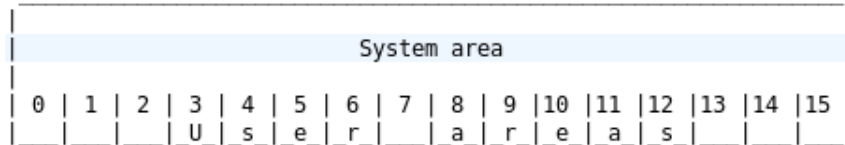


Figure 4: Conceptual map of CP/M user areas

of the particular disc you are using. Those who think CP/M's PIP command is for masochists should try and get to grips with MS-DOS directory paths!

With CP/M Plus, files can be grouped by activities so that all related files are in a single user area. With word-processor, database and spreadsheet programs all in the 'system area' instead of in separate sub-directories as in MS-DOS, files do not have to be transferred between sub-directories. Instead, the database or spreadsheet program can be loaded from the 'system area' and, when the necessary data has been output, the word-processor can be loaded to complete the report — all without ever leaving the relevant user area. Indeed, CP/M Plus encourages good computing practice by allowing you to keep your data in user areas separate from your programs which can be called from the system area at any time.

One way of looking at CP/M's user areas is as sixteen workspaces, none of which can normally communicate with each other — all of which can communicate with programs with user number 0 and the 'Sys' attribute (Figure 4). But this is also misleading because both MS-DOS sub-directories and CP/M user areas are dynamic — that is to say, a sub-directory or a user area is only as big as the files in it. If you add more files it grows in size; if you delete files it shrinks. The only limit is that the total number of files or the total size of all the files in all sub-directories or user areas must not exceed the limits for the disc as a whole. In general, if you have a 720K disc drive or a hard disc, you are better off using CP/M user areas. A hard disc partition is always a fixed size — a user area grows and shrinks as necessary.

But here the similarity between MS-DOS and CP/M Plus ends. Every time you want to add or remove a sub-directory in MS-DOS, you have to issue particular instructions. With CP/M Plus, user areas are 'created' or 'removed' simply by leaving a file in the user area or deleting all files in the user area.

Note that the 'system area' and 'user areas' spread across all available disc drives; so any program in the 'system area' on drive A: can be used with files in any user area on any drive. Files in user area 3 on drive B can be used with files in user area 3 on drive A: but NOT with files in any other user area.

If you want to give any of your programs the 'Sys' attribute, you need to use SET.COM. Load CP/M from your system disc; then enter

```
SET d:filename.ext [sys]
```

where 'd:' is the drive and 'filename.ext' the name of your file. To make individual files 'Read Only', enter

```
SET d:filename.ext [ro]
```

## 2 Setting things up

In Section 1 I tried to set out the background to the 'attributes' every CP/M file has — its 'user area', its 'Sys(tem)' or 'Dir(ectory)' status and whether it is a 'Read/Write' or a 'Read Only' file. Now I would like to explain how to handle these and one other attribute, for which you will need CP/M Plus, but all of which can safely be used on AMSDOS discs. As I explained, you will need SET.COM. Enter

```
SET d:filename.ext [sys]
```

to make a file a 'Sys' file and

```
SET d:filename.ext [ro]
```

to make a file 'Read Only'. Replace 'sys' with 'dir' and 'ro' with 'rw' (for 'Read/Write') to return a file to its original status.

A 'Read Only' file cannot normally be deleted or altered unless you use SET to change it to 'Read/Write' status. There are, however, two exceptions to this rule. If you FORMAT a disc, you destroy the directory as well as the files on the disc so the information about which files are 'Read Only' is destroyed at the same time. If you use PIP (the 'Peripheral Interchange Program') to copy files, you cannot normally copy a new version of a file over its old version if the old version is 'Read Only'. PIP will stop and issue an error message. However, you can override this by adding [w], meaning 'write in any case', to the end of your instructions to PIP.

PIP also assumes that you will not normally be copying 'Sys' files; it will therefore stop and tell you politely that the file was 'not found' — unless you add [r] to indicate that you really do want PIP to 'read' a 'Sys' file.

Another thing PIP assumes is that you will rarely want to copy files between different user areas. So while PIP will happily copy and link together files from several different disc drives as long as the user area is the same, it needs to be told very clearly to 'go to user area 3 with the file you got from user area 5' if you want to copy a file between different user areas. To do this with PIP Version 3 loaded and the \* showing, you would enter:

```
b: [g3]=b:filename.ext [g5]
```

However, PIP always leaves the original file where it found it so you end up with two copies in different user areas. Locomotive Software, who created AMSDOS, came up with a different solution if you only want to move a file from one user area to another. Using AMSDOS,

```
|REN,"0:filename.ext","5:filename.ext"
```

will 'rename' the file's user number, so effectively moving it from user area 5 to user area 0.

Finding out where files are is fairly easy with CP/M Plus; use your system disc (your backup, not the original!) to load CP/M Plus and then, with the disc you want to examine in drive B: or, if you have a single drive, with it ready for the prompt to swap discs, enter:

```
DIR B: [user=all]
```

You can enter a user area with 'USER n' where 'n' is the user number but it is usually easier, particularly if you are changing disc drive at the same time, to put the user number in front of the disc drive label. So

```
USER 1
```

or

```
1A:
```

logs you on to user area 1, drive A and the A> prompt changes to 1A> while:

```
3B:
```

logs you on to user area 3 and drive B: and the prompt changes to 3B>. Though CP/M Plus does not show it, a simple A> or B> stands for 0A> or 0B> and to get back to user area 0 on drive A: from

another user area, you need to enter

```
0A:
```

A simple 'A:' does not change the user area, only the disc drive.

Though this is mainly about CP/M Plus, it may be worth adding a couple of points about AMSDOS which is, in effect, an 'improvement' on CP/M version 2.2. Instead of having a 'system area', AMSDOS allows users to use programs and data in any user area by simply adding the user number to the filename; so

```
run "6:myprog
```

will run the program 'MYPROG.BAS' in user area 6 and you can save and load data to and from any user area so long as its user number is specified in the command. So AMSDOS users can also make full use of user areas to group their files. The AMSDOS command to change to another user area is:

```
|USER,n
```

where 'n' is the new user area. If you use this and then enter 'CAT', the preface to the catalogue will say 'User area n' and the amount of free space will take into account the files in other user areas.

There is one more 'attribute' to describe — the Archive attribute. This is only available with PIP Version 3 supplied with CP/M Plus but can be used on AMSDOS discs. Try this: using your system disc (your backup, not the original!), load PIP and copy KEYS.WP from side 1 to any other disc adding [a] at the end of the PIP command line, as in

```
b:=a:keys.wp[a]
```

Then repeat the command and you will get a very unhelpful 'File not found' from PIP. But, if you exit PIP and enter

```
DIR
```

you will find the file is still on drive A:. Entering:

```
DIR [full]
```

shows that KEYS.WP now has 'Arcv' after 'Dir RW' (Figure 5).

KEYS.WP will lose this attribute when the file is amended and then the command 'PIP b:=a:keys.wp[a]' will result in a copy of the amended file being made. The Archive attribute can be turned off with

```
SET KEYS.WP [archive=off]
```

If you use [a] every time you back up data, PIP will copy only those 'Dir' files which have been changed since the disc was last backed up. Add [r] or [g] if backing up a file with the 'Sys' attribute or one in a different user area.

Three final points: firstly, most older programs, like Supercalc, do not understand user areas but, if you make all the Supercalc files in user area 0 into 'Sys' files with:

Directory For Drive A: User 0

Name	Bytes	Recs	Attributes	Name	Bytes	Recs	Attributes				
AMSDOS	COM	1k	8 Dir RW	BANKMAN	BAS	1k	7 Dir RW				
BANKMAN	BIN	2k	12 Dir RW	C10CPM3	EMS	25k	200 Dir RW				
DATE	COM	3k	23 Dir RW	DEVICE	COM	8k	58 Dir RW				
DIR	COM	15k	114 Dir RW	DISCKIT	COM	6k	48 Dir RW				
ED	COM	10k	73 Dir RW	ERASE	COM	4k	29 Dir RW				
GET	COM	7k	51 Dir RW	KEYS	CCP	1k	3 Dir RW				
KEYS	WP	1k	3 Dir RW Arcv	LANGUAGE	COM	1k	8 Dir RW				
PALETTE	COM	1k	8 Dir RW	PIP	COM	9k	68 Dir RW				
PROFILE	FR	1k	1 Dir RW	PROFILE	SP	1k	1 Dir RW				
PROFILE	UK	1k	1 Dir RW	PUT	COM	7k	55 Dir RW				
RENAME	COM	3k	23 Dir RW	SET	COM	11k	81 Dir RW				
SET24X80	COM	1k	8 Dir RW	SETDEF	COM	4k	32 Dir RW				
SETKEYS	COM	2k	16 Dir RW	SETLST	COM	2k	16 Dir RW				
SETSIO	COM	2k	16 Dir RW	SHOW	COM	9k	66 Dir RW				
SUBMIT	COM	6k	42 Dir RW	TYPE	COM	3k	24 Dir RW				
Total Bytes = 148k				Total Records = 1095				Files Found = 30			
Total 1k Blocks = 148				Used/Max Dir Entries For Drive A: 31/ 64							

Figure 5: Output of DIR [full] showing 'Archive' attribute

SET B:SC2\*.\*[sys]

(either by using a separate drive B: or by swapping discs as requested), you can then log onto a different user area and run Supercalc from within a different user area. All your data files will be saved to this user area but, if you exit Supercalc and change the user area again, Supercalc will still run from the new user area but your old data files will be inaccessible in the previous user area until you exit Supercalc and log back into the previous user area again.

Secondly, you will find that some directory displays may look rather odd because CP/M uses the 'eighth bit' of certain characters in a filename to record some of the attributes. Since each character in a filename only needs seven bits, CP/M interprets the eighth bit separately from the first seven. But older programs interpret the eighth bit as part of the letter and display funny characters on the screen.

Thirdly, every time you save a new version of a 'Sys' file CP/M resets the 'Sys' attribute to 'Dir' and leaves it in the current user area. This happens whenever I add a new word to the supplementary dictionary in my spelling checker because the program re-writes the whole supplementary dictionary with the new word in the correct alphabetical sequence. In order to access the supplementary dictionary from all user areas, I have to reset the 'Sys' attribute for this one file and, in some cases, copy it back to user area 0 after I have added a new word. I use a SUBMIT file to carry this out each time but more recent programs cope with this automatically.

Everything I have talked about so far can be done on standard data format discs which can be used by both AMSDOS and CP/M. But when Digital Research decided to replace version 2.2 with version 3, or CP/M Plus as it later became known, it knew it had to offer better directory facilities. This meant re-writing the information stored on the directory tracks of the discs.

The new directory tracks could not be read by version 2.2 but many users would want to continue using discs on both version 2.2 and version 3 machines. So CP/M Plus was written to be able to read both the older and the newer format discs. AMSDOS follows the older format used by version 2.2 so 6128 owners can choose either format. DISCKIT in fact only produces

```

Label for drive B:

Directory      Passwds  Stamp   Stamp   Stamp
Label          Reqd    Create  Access  Update
-----
B:NEWNAME .   on     off    on     on...

```

Figure 6: Screen display after labelling a disc

old format discs. To create a new format disc, you must take an existing old format disc and use INITDIR (for ‘Initialise Directory’) to create the new format. Once you have done this, a whole new world of attributes, including disc labels, date and time stamps and passwords, becomes available to you. That is the subject of the next section.

### 3 Keeping track

When Digital Research developed CP/M Plus, they changed the format of the directory tracks to accommodate the new facilities. But they made sure that CP/M Plus could create and use older format discs by writing a separate program, INITDIR.COM, to make and undo the necessary changes. INITDIR is on side 2 of your CP/M Plus system disc. If you put a blank formatted disc in drive B and enter

```
INITDIR B:
```

you will be asked if you want the directory reformatted. If you answer y, INITDIR will go ahead. If it finds the directory already formatted for CP/M Plus, it will ask if you want to reclaim the directory space. If you answer y, it will restore the directory to the old format understood by AMSDOS. Because AMSDOS can only understand the old format, you MUST heed the dire warnings in the manual about never using date-stamped, i.e. CP/M Plus format, discs with AMSDOS.

The new format allows two dates and a password for each file and a name for the disc as a whole. You can also protect your settings on the disc with a further password! You can choose to store either the date you created a file or the date you last used (accessed) it and the date you last updated the file. There isn’t room for all three. The file date and time stamps, passwords and protect levels are stored in every fourth directory space. So a floppy disc formatted using INITDIR can only have three-quarters the usual number of entries — 48 on a 178K disc.

To set all these attributes, you use SET on side 1 of your CP/M Plus system disc. If you enter

```
SET B:[access=on,update=on,protect=on,name=newname]
```

SET will respond as shown in Figure 6. Substitute ‘create=on’ for ‘access=on’ if you prefer to store this date/time stamp. Directory labels take the same form as filenames, eight characters and a three letter extension. In fact, if you use all the characters, CP/M Plus issues an error message but still installs the label correctly — the only ‘bug’ I have found.

Of course, unless you have the dk’tronics Real Time Clock, all this setting of date stamps won’t automatically produce any meaningful results. Mere mortals have to tell CP/M the date and time every time we load CP/M by using DATE.COM. Enter

```
DATE SET
```



```

Label for drive B:.
Directory   Passwds  Stamp  Stamp
Label      Reqd    Access Update  Label Created  Label Updated
-----
NEWNAME .   on      on     on     12/23/90 19:35 12/23/90 19:35

```

Figure 7: Screen display in response to SHOW B: [label]

```

Scanning Directory...
Sorting Directory...
Directory For Drive B: User 0

```

Name	Bytes	Recs	Attributes	Prot	Update	Access
DIRFULL TXT	1k	2	Dir RW	None	12/23/90 19:36	12/23/90 19:36
LABEL TXT	1k	2	Dir RW	None	12/23/90 19:35	12/23/90 19:36

```

Total Bytes      = 2k  Total Records =      4  Files Found =    2
Total 1k Blocks =  2  Used/Max Dir Entries For Drive B:  4/ 64

```

Figure 8: Output of DIR B: [full] for a CP/M Plus formatted disc

and you will be prompted for the current date (in US format) and the current time after which you are asked to press a key to load the new values into the the system clock.

If you use SHOW.COM, you will find that CP/M records the date you create a label. Enter SHOW B: [label]

and you should see something like Figure 7, if you have already used DATE.COM. Otherwise the date will be in 1982!

Once you have put one file onto a CP/M Plus format disc, you will find that DIR B: [full] produces a quite different display (Figure 8). Instead of two columns of filenames, the second column is taken up with information about the CP/M Plus attributes.

'Prot' stands for 'Protection'; if password protection has not been set, this column remains blank; 'None' indicates that, though the two files can be protected, no protection is being given to them.

When you first assign a password to a file, you must normally choose a level of protection; there are four levels READ, WRITE, DELETE and NONE. If you set READ, only password holders can do anything with the file; if you set WRITE, anyone can read the file but only password holders can change it; if you set DELETE, anyone can read or change it but only password holders can rename or delete it. NONE removes all protection.

So, if you wanted to stop anyone seeing SAMPLE.TXT on drive

B:, you might enter:

```
SET B:SAMPLE.TXT [protect=READ,password=JEMIMA]
```

Thereafter you would have to include the password every time you accessed the file. You can do this by adding a semi-colon followed by the password to the end of the filename. So, for example, if you wanted to display SAMPLE.TXT on the screen, you could enter

```
TYPE B:SAMPLE.TXT;JEMIMA
```

If you wanted to change the level of protection, you could enter

```
SET B:SAMPLE.TXT;JEMIMA [protect=WRITE]
```

If you wanted to change the password, you could enter

```
SET B: SAMPLE.TXT; JEMIMA [password=ELEPHANT]
```

Alternatively, you could deliberately leave out the password. In this case, CP/M Plus would respond with 'Password?' and wait until you had entered it correctly before proceeding. This might be preferable if someone is looking over your shoulder as CP/M does not show the password on the screen as you enter it.

However, you must include the password if you are using PIP and want the copied file to be protected; so, for example,

```
A: NEWCOPY.TXT; AUGUSTUS=B: SAMPLE.TXT; ELEPHANT
```

will copy SAMPLE.TXT on drive B to NEWCOPY.TXT on drive A adding the password 'AUGUSTUS' provided protection is already ON for the disc in drive A. The protection level is automatically set to READ and you will have to use SET if you want to change it.

If you want to remove protection from a file, you simply set protection to NONE. If you want to remove all passwords from a disc, you enter

```
SET B: [protect=off]
```

To stop anyone else doing this, you can protect the settings on your disc with, for example,

```
SET b: [password=GEORGE]
```

This will prevent anyone who does not know the password from changing any of your settings. In this case, there are no levels; protection is absolute! It does not stop people from using unprotected or partially protected files in accordance with your settings. They simply cannot change your settings.

Using password protection is relatively easy if you have a program written with CP/M Plus in mind. But most of the well-known programs, like WordStar, dBASE and Supercalc, were written before CP/M Plus was developed and, if you give them a password, they will either ignore it or throw up an error message. In any case CP/M Plus will stop them accessing the file and, if you proceed, you could get into all sorts of trouble if you try and create a new file with the same name as one already on the disc.

CP/M Plus offers a way round this. If you have given all the files on the disc the same password, e.g. REGENCY, with

```
SET B: *.* [protect=READ, password=REGENCY]
```

you can then enter

```
SET [default=REGENCY]
```

before loading the program you want to use. Then, whenever the program tries to open a file without providing a password, CP/M checks whether the password assigned to the file matches the default and, if it does, allows the program to proceed.

As with the attributes 'Sys' and 'RO' dealt with in an earlier piece, the protection level and password may not be transferred to new files created by a program which does not understand passwords and cannot therefore include them in the filenames of any new files it creates. So, at the end of the session you may have to re-enter

```
SET B: *.* [protect=READ, password=REGENCY]
```

to restore password protection to all files.

I have tried to show that there is more to a file than its filename; when CP/M and AMSDOS search for a file on a disc, they are not only looking for a file with a certain filename, they are also looking for a file with certain 'attributes', for example, a particular user number, 'Dir' and 'Read/Write' status. So when CP/M says 'No file' or 'File Not Found', it doesn't always mean that there is no file with that filename on the disc; it may mean 'there is no file on the disc with that name and the attributes I expect to find'. Like all operating systems, CP/M

is programmed with certain assumptions about what are reasonable operations for it to carry out. If you want it to do something with a 'Sys' file or over-write a 'Read Only' file, CP/M expects you to tell it so explicitly. Like a good security manager, it may stop you or put up a facade of incomprehension if you try something without the necessary authorisation.

At the start of this series, I described CP/M Plus as 'one of the best operating systems for microcomputers'. In spite of its occasional perversities and unhelpful messages, CP/M Plus deserves the accolade for its handling of 'Read Only' files, for encouraging the separation of programs in the system area from data in the various user areas, for its password protection and for its unobtrusive date and time stamping and archiving of files.

If you want similar helpfulness and flexibility on a 16-bit machine, you will have to turn to CDOS or DR DOS, both from Digital Research, the developers of CP/M Plus.

The document is licensed under the  
[Creative Commons Attribution-NonCommercial-ShareAlike 4.0](https://creativecommons.org/licenses/by-nc-sa/4.0/)  
International

