

**THE  
ADVANCED  
PLUS  
3**

## CHECKLIST

1. A.P.3. GUIDE (This book)
2. A.P.3. Disc Interface
3. 3.5" Disc drive
4. Mains adaptor
5. Welcome disc
6. ADFS Guide

# THE ADVANCE PLUS 3

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This booklet describes the fitting and use of the 'P.R.E.S.' Plus 3 Disc Expansion Unit for the Electron. More detailed information on how to get the most from your A.P.3. are contained in the main documentation of the package - The ADFS Guide.

The Plus 3 allows the Electron to use 3.5 inch microfloppy and / or 5.25 inch minifloppy discs instead of cassette tape as an external storage medium. The discs are controlled by the Advanced Disc Filing System - ADFS for short. The ADFS Guide is divided into two parts, the first describing the the facilities it provides, and the second giving detailed reference information for more advanced users.

The Plus 3 can only be used with an Electron fitted with the Plus 1 interface.

**Discs** are used in a similar way to the cassette tapes that you are probably used to, but have several advantages: they are much quicker when saving and loading programs, hold more information, and provide added features such as 'random access' and directories. **Discs** can store up to 320K bytes of data (or 640K bytes using double-sided discs). In terms of text, this enables you to store about 120 sides of A4 text on a disc.

## Installation of the PLUS 3 package

As mentioned, the Plus 3 needs to be fitted into the Plus 1 expansion box. There should be four items; 1: The Plus 3. 2: The disc drive. 3: The disc drive mains adapter. 4: The Welcome disc. The Welcome disc acts in a similar way the the Welcome tape that you got with your Electron, but contains many useful additional utility programs.

## Adding a Plus 3 to the basic Electron

Switch off the Electron at the mains. Push the Plus 3 into the rear slot in the Plus 1 expansion box, with the connector facing away from you. The **Disc** drive interface cable now plugs into the connector on the Plus 3. Finally connect the mains adapter into the back of the **Disc** drive. The Electron and Plus 3 are now ready for use.

Note that if you want to use a 5.25 minifloppy external disc drive with the Plus 3, it should have a standard Shugart connector and interface, and must have its own power supply.

## Discs

Once the Plus 3 has been added to your system, it may be used as described in section below, 'Introducing the ADFS'. However, you are advised to read this section first as it will give you an appreciation of how to handle the microfloppy discs that play such an important role in the use of the Plus 3.

The discs used by the Plus 3 package are 3.5 inch microfloppies. The size refers to the diameter of the disc itself, which is hidden by a stiff protective sleeve.

When you insert the disc into the drive, the top side must be uppermost and the disc is inserted into the slot in the direction shown by the arrow on its top surface.

There are two varieties of Disc drive that can be used with the Plus 3, single-sided and double-sided, which refers to the type of drive. The former uses only one side (the bottom surface) of the disc, and stores 320K bytes. The latter uses both sides, and consequently holds up to 640K bytes of data. The only time that you need to know about this difference is when formatting a disc using the \*EFORM utility (see chapter 3). You do not, for example, need to tell the Plus 3 to use the second side of a dual-sided disc; it knows automatically when to do it.

The Plus 3 is supplied with a Welcome disc which, although it contains many useful programs, has enough space on it for you to experiment with the disc filing system. We recommend, however, that you obtain at least two blank discs, one for a backup (copy) of the Welcome disc and another for your own use.

### Formatting discs

When a disc is supplied, it is in a blank state known as 'unformatted'. The disc cannot be used for storing information and programs until it has been through a process called formatting. An unformatted disc may be likened to a sheet of blank paper on which you can't write until lines have been drawn on it. The formatting process is equivalent to drawing the lines and margins.

Formatting divides the disc into concentric circles known as tracks, and divides each track into a number of partitions known as sectors. The disc does not change visibly after formatting; the tracks and sectors are simply magnetic signals recorded on the surface of the disc that enable the drive mechanism to find any section of the disc quickly.

The program to format discs is provided on the Welcome disc as a utility called EFORM. Chapter 3 describes how to use and obtain documentation on the utilities supplied. In addition formatting and copying the Welcome disc is described below, as this is such an important part of using the Plus 3.

When formatted, the discs used by the Plus 3 have 80 tracks, and there are 16 sectors on each track. Each sector contains 256 bytes (or characters) of information. On a single-sided disc this gives:

$$80 \text{ tracks} \times 16 \text{ sectors} \times 256 \text{ bytes} = 327,680 \text{ bytes} = 320 \times 1024 \text{ bytes}$$

In computing the number 1024 is written K, so the Plus 3's discs are said to have a capacity of 320K (or 640K) bytes. When a disc is formatted most of this is available to the user.

# CARE OF DISCS

A disc will give best results if it is formatted, written and read at about the same temperature. Do not expose to direct sunlight.

1. Keep the disc away from strong magnetic fields, such as TV sets/monitors, loudspeakers and the mains adapter unit. As the disc is a magnetic device, it may be erased by exposure to other powerful magnetic devices.
2. Always store discs away from dust, cigarette smoke etc. Although the disc is protected by the stiff sleeve, dust may get into the envelope when the disc is in the drive, or through the two small holes in the centre of the underside of the disc. Even the tiniest of dust particles can cause a fatal scratch on the surface of the disc when it is spinning in the drive.
3. Avoid exposing discs to extremes of temperature and humidity. The recommended ranges of temperatures are: Storage: 4 degrees C to 51.5 degrees C. Transportation: -40 degrees C to 51.5 degrees C.
4. Do not insert or remove discs when the red drive light is on. When the drive is active, information may be written to the disc. Trying to remove it when this is happening will cause the information to be written as 'garbage' and the disc may be 'corrupted' so that it may not be used again without being reformatted. Think of the damage you could do to a record by removing it from the deck without lifting off the arm first. Equivalent damage could befall a disc removed from an active drive.
5. Do not physically knock the disc drive while the disc is being accessed, particularly if the disc is being written to. This may cause errors which don't become apparent until later, usually in the form of 'Disc error' messages.
6. As with all disc systems, you should ensure that any disc is removed from the drive before switching power on or off to the system. This makes absolutely sure that the disc cannot be corrupted or overwritten while the system is initialising (before the Electron takes control).

## Preventing accidental erasure (3.5 inch Discs)

When valuable data is stored on a disc it is obviously important to keep it safe from accidental erasure. There exist commands to delete information from a disc, and these can be made 'safe' using other commands which protect individual files. However, there are two 'dangerous' utility commands which although very useful can cause a lot of heartache if used incorrectly. These are \*EFORM, which formats a disc, overwriting any information already stored on it, and \*BACKUP, which copies all the information from one disc to another, destroying the contents of the second disc.

To prevent these potentially disastrous operations from being performed, each disc is fitted with a write protection tab. The Disc is 'write protected' when the tab is furthest from the metal shutter. In this state, the disc may not be written to in any way, ie **it is** impossible to save programs or format the disc or backup another disc on to it.

By sliding the tab to the other extreme, you can make the disc unprotected. Any program may now write information on to the disc, so you can save programs, format and backup on to the disc.

With 5.25 inch Discs, 'write protection' is achieved by fitting a special sticky label over the notch in the side of the disc.

### Making backup copies

Although discs are very reliable, it is important to keep backups, or security copies, of important programs and data. This safeguards against files being lost through accidental erasure, or through a disc becoming 'corrupt' and unreadable, for example if there is a power failure while information is being written to the disc.

The simplest method is to copy the whole disc, or selected important files, on to another formatted disc at regular intervals. The size of the interval depends on the frequency with which information on the disc is changed. If, for example, only minor changes are made to a single file each day, backups could be made at the end of the week. If, however, several completely new files are created every day, daily backups would be more sensible.

A more rigorous backup technique is the so-called 'grandfather, father, son' method. This involves the use of a master disc and three backups. Copies are made at intervals, as follows:

Stage 1, MASTER copied to GRANDFATHER  
Stage 2, MASTER copied to FATHER  
Stage 3, MASTER copied to SON

After the third stage the cycle repeats (ie MASTER copied to GRANDFATHER after the fourth interval and so on). Again, the time between backups depends on the amount of information that changes on the disc. This technique is important if you are using discs in a business where the loss of information can be very expensive.

There are two programs which will perform the actual copying. One of them, invoked by the command \*BACKUP, copies the whole of one disc on to another one. This is very thorough, but involves a lot of swapping of discs on a single drive system. The other, \*DIRCOPY, is more selective as you tell it exactly which files are to be copied.

More information can be obtained on these commands by using the \*UTILS command described in chapter 3.

# INTRODUCTION TO THE ADFS

After the Plus 3 has been fitted as described earlier, it should be ready for use. Remove any cartridges before proceeding. The Plus 3 is fully compatible with the Plus 1 and the Acornsoft 'language' cartridges that are available for it. In the description below, however, we will assume that BASIC is the language in use, hence the need to remove the cartridges from the Plus 1.

Plug in, and turn on, both the Electron and Disc drive power supplies. The Electron will start up as usual with a beep. The start-up message will look slightly different from normal:

```
Acorn Electron
```

```
Pres ADFS
```

```
BASIC
```

```
>_
```

If you don't get the messages printed above, there may be something wrong with your Plus 3. See Appendix A for possible problems.

The 'Pres ADFS' message tells you that the disc system is functioning correctly. ADFS stands for 'Advanced Disc Filing System'. References in this text to ADFS and its use refer to the ADFS Guide.

The Plus 3 is almost ready for use: all you have to do now is insert a disc and inform the filing system that you have done so. Insert the Welcome disc that comes with the Plus 3. The disc should be oriented so that the metal shutter is away from you and the side of the disc with the label is uppermost. (Actually it is impossible to insert the disc incorrectly, so you will soon find out if you're doing it wrong). Push the disc into the slot firmly but carefully, so that it 'locks' into position.

When you want to remove a disc, press the button to the right of the drive slot. Never, however, eject a disc when the red drive light is on.

To tell the ADFS that it now has a disc that it can use, the command \*MOUNT must be given. You may have used \* commands before, for example when obtaining a list of files on a tape using \*CAT. When you type

```
*MOUNT
```

the red light on the left of the drive will glow, indicating that the drive is in use. We assume throughout this manual that you remember to press <RETURN> after each command. After a short period the BASIC prompt will reappear. When the drive was activated, the ADFS loaded some important information from the disc into the Electron's memory. This included a list of the files (programs and data) on the disc.

When you insert a disc into the drive, you should type \*MOUNT. If you

don't the ADFS will not **be** aware that you have changed the disc and operations such as loading and saving files will not work properly. See chapter 2 for more information on this command.

Next, type the command

```
*LIB LIBRARY
```

This command tells the ADFS how to find utility programs on the disc. It is not important that you understand the command at this stage; it is simply required so that the formatting and backup utility programs may be used in the next section. Note: You can tell the ADFS to perform the action of the \*MOUNT and \*LIB commands automatically simply by holding the A key down when you switch the machine on, or by holding <CTRL> A down, then pressing and releasing <BREAK>. The disc drive will come on while the ADFS performs the \*MOUNT and \*LIB action. The usual 'bleep' which accompanies a hard reset will have an intermittent sound; this is nothing to worry about.

### Backing up the Welcome disc

As mentioned in the last section, we strongly advise you to make a backup of . the Welcome disc, so the method for doing this will be described now.

You have to format a blank disc before a backup can be made, so with the Welcome disc still in the drive type the command:

```
*EFORM
```

This runs the program that formats the disc. You will be asked for two pieces of information before the disc can be formatted. First, the drive number of the disc is required. If you have a single drive (ie you haven't added a second drive) type the digit 0 (there is no need to press <RETURN>). If you have a second drive and wish to use it, press 1 instead.

Next the program asks for the size of the disc. The options are L,M and S. Type M if you are using a single-sided drive, L for a double-sided drive.

You will then be asked to place the disc to be formatted in the drive indicated. If this was 0, take out the Welcome disc by pressing the eject button on the right side of the drive, and insert the blank one. If you specified drive 1, simply insert the new disc into the second drive.

To start the formatting process, type GO. Formatting a single-sided disc takes just over one minute, including the automatic verification of the disc which EFORM performs. At the end of the process you are given the option of formatting another disc by typing Y, or terminating the program by typing anything else.

When you have formatted a disc, you may copy the Welcome disc on to it. To do this, the utility \*DIRCOPY is used. Reinsert the Welcome

disc and type:

\*BACKUP

This is a BASIC program which will prompt you for the required information. The prompts and the answers you must give are as follows:

<u>Prompt</u>	<u>Response</u>
Input source drive	0
Input destination drive	0

After typing the last response, you will repeatedly be asked to insert the source disc (the original Welcome disc) and the destination disc (the newly formatted one).

When the copy has finished you should put the master copy of the Welcome disc in a safe place. The remainder of this section introduces a few of the ADFS commands and assumes that the Welcome disc is in drive 0.

### Starting to use the ADFS

While using cassettes, you have probably used the \*CAT or \*. command to find out what files are on the tape. Exactly the same command may be issued to see what is on the disc, so type:

\*CAT

The screen will show a list of filenames in two columns down the screen. Typically, the catalogue listing will look like this:

```
Welcome          (13)
Drive:0          Option 03 (EXEC)
Dir. $           Lib. "LIBRARY"

!Boot           LWR(10) HELP           DLR(05)
LIBRARY         DLR(12) WELCOME       DLR(13)
```

In addition to the filenames on the bottom two lines, various other pieces of information are printed, for example what the name of the disc is (Welcome in this case). All of this information is explained in detail in the ADFS Guide. For now, only the filenames concern us.

Unlike the cassette filing system, the ADFS knows exactly what files a disc contains (because this information was loaded when the disc was \*MOUNTed). It does not have to search laboriously through the disc, printing the names of files as it encounters them. This makes the operation of \*CAT much quicker than using tape, and you don't have to press <ESCAPE> to 'get out' of the command: the ADFS knows when it has printed all the filenames.

The catalogue example above shows four files: '!BOOT', 'HELP', 'LIBRARY' and 'WELCOME'. Of these, one is a normal file, and the other three, 'HELP', 'LIBRARY' and 'WELCOME' are special files called

'directories'. A directory file contains information about other files on the disc, eg their names and lengths. Directories are a very important part of the ADFS and we shall have a lot more to say about them in the ADFS Guide. For now though, we will experiment with the disc, treating it as a much faster version of a cassette.

```
To see the effect of saving a file on the disc, try saving a small
BASIC program. If you are stuck for inspiration, type the following:
NEW
10 FOR I%=32 TO 126
20   VDU I%
30 NEXT
40 PRINT ' '
```

Save the program in the usual way:

```
SAVE "TEST"
```

The red light on the disc drive will come on, indicating that some action is taking place on the disc. A couple of seconds later the BASIC prompt will reappear and the drive light will go out. Even from saving this very short program you should be able to tell that discs are much faster than tape.

To make sure that the file was saved properly, type another \*CAT command. This time, a new name will be listed: "TEST". The file should be easy to find as entries are printed in alphabetical order (going across the screen, then down). Next to the name are the letter WR.

These tell us what operations are allowed on the file: 'W' means it is possible to write to it and 'R' means the file can be read (eg loaded into memory). The number in brackets after WR is called the file's sequence number, and relates to the age of the file (ie how long ago it was saved).

A file may also be loaded, of course. To illustrate this, type in the commands:

```
NEW
LOAD "TEST"
```

Again, the red drive light will indicate that the drive is being accessed. After a few seconds the file will be loaded and it may be listed or executed as normal.

When using cassettes, you could delete a program that you no longer wanted simply by recording something else over it (sometimes without meaning to!) With discs, you can employ a similar technique. By saving another program under the same name as one that is already on the disc, the original will be overwritten and lost forever. For example, with 'TEST' loaded in, add the line:

```
1 REM This is a new version of 'TEST'
```

Then save it, again using the name 'TEST': SAVE "TEST"

The previous version of the program is now lost and only the new version is on the disc. Obviously in this example there is nothing tragic about losing the first version of the program as it was very similar to the current one. However, you should be careful not to save completely different programs under the same filenames unless you are absolutely sure the first one isn't required any more.

To get rid of a program altogether so that it no longer exists on the disc, you have to type a special command. This the \*DELETE command. To delete 'TEST', type in

```
*DELETE TEST
```

Notice that \* commands don't require quotation marks around filenames, though you can put them there if you like. This command will erase 'TEST' so that if you now do a \*CAT, "TEST" will not be listed. There is no equivalent to BASIC's OLD command in the ADFS, so if you delete a program on the disc it is gone for good - be warned!

There are plenty of other \* commands provided by the ADFS. These perform such diverse functions as running machine code programs, printing information about files and telling you how much free space there is on the discs. These are all described in chapters 2 and 3. Chapter 4 describes what you can do with the ADFS when using BASIC.

