



THE ULTIMATE RANGE OF MEMORY DEVICES



Chapter 1

Introduction to the

Memory Backup Device

System

1.1

Welcome

Congratulations upon purchasing one of the latest memory backup devices, for the BBC computer system.

You have just taken possession of one of the most upto date and capable systems that is available on the market and you will want to make the very best use of your new equipment — hence this manual.

As you will know, the devices contained in your new add-on unit are state-of-the-art technology at a reasonable price and to help any user, they have been made as user-friendly as possible. However, there are a few hints and tips which we, the producers of the product, feel will help you to make these units easier to use and help you over any problems that you may have.

The following pages contain sections on Floppy Disc Drives, Winchester Disc Drives and Streamer Archivers, the three components of the Memory Device system. You may have only purchased one or two of these units in which case you will need to read only the relevant chapters. We felt that you might like to know how the other units in the system would integrate to those you have already purchased and therefore this booklet contains details on all three components.

1.2

How to use this manual

This manual has three more chapters:

Floppy Disc Drives
Winchester Disc Drives
Streamer Archivers & Software

Firstly, you need to decide which parts of this manual are relevant to the unit which you have purchased. To help you do this please consult Table 1 which details all the components of the unit which you have bought and also suggest an upgrade path if you wish to extend the system at a later date.

Table 1 The full range of memory backup devices

Model	Components contained	Upgrades possible
Nucleus 20 (20 megabyte)	Floppy disc drive Winchester Hard Disc Drive Streamer Archiver	
Nucleus 40 (40 megabyte)	Floppy disc drive Winchester Hard Disc Drive Streamer Archiver	
UFD 2000 (20 megabyte)	Floppy disc drive Winchester Hard Disc Drive	Streamer 10
UFD 4000 (40 megabyte)	Floppy disc drive Winchester Hard Disc Drive	Streamer 10
Archive	Floppy disc drive Streamer Archiver	HD 2000, HD 4000
HDS 2000 (20 megabyte)	Winchester Hard Disc Drive Streamer Archiver	Any disc drive
HDS 4000 (40 megabyte)	Winchester Hard Disc Drive Streamer Archiver	Any disc drive
HD 2000 (20 megabyte)	Winchester Hard Disc Drive	Archive Any disc drive
HD 4000 (40 megabyte)	Winchester Hard Disc Drive	Archive Any disc drive

As you can see from Table 1, the full expansion system comprises a Floppy Disc Drive, one Winchester Hard Disc Drive and a Streamer Archiver. This gives you a fast access memory store of up to 80 megabyte — enough to hold all the books of the Bible and a few more!

Of course no-one is suggesting that you need to start with the full system and we hope that this booklet will convince you that any unit you buy will add extra facilities to your working BBC system.

1.3 Your BBC Computer

This range of memory backup devices is especially designed and built to complement your existing BBC computer system.

There are three ranges of BBC computer that this system is designed for and in almost all cases the operation is identical, where this is not the case this manual will make this quite clear. There is a minimum specification for each model however and this needs to be made clear before you try to use your memory device. Table 2 makes clear the specification that is required for each possible model.

Table 2 Minimum computer specification required

Computer Model	Minimum Specification
BBC Master	Standard specification only
BBC B + 64K & 128K	ADFS needs to be fitted
BBC Model B 32K	Needs 1770 disc interface and ADFS fitted
Econet users	Level 3 File Server Software

ALL users are advised that an ADFS manual will help them to get the most from their system. These manuals are available from your dealer. The partial details supplied within the Master User Guide are unlikely to be adequate.

The reason for these additions to the standard specification of the "B" models is to support the ADFS (Advanced Disc Filing System) which must have a 1770 based floppy disc controller chip, the older 8271 chip can't support double density. If your BBC computer doesn't match this specification then you should contact the dealer who supplied this device and they will give you details of cost and availability of extra facilities you require.

1.4

What do the various system components offer me?

There are further details of the components and their use in the relevant chapters but a short resume of the facilities seems appropriate for this introduction.

Floppy Disc Drives

This simple storage medium gives users the facility to transfer files to other computers which don't have a Winchester Hard Disc Drive and allows hard disc users to take programs provided on floppy disc and place them on the Winchester.

Winchester Hard Disc Drive

This unit offers the user extremely fast and massive program or data storage with the minimum of difficulty. Unlike Floppy disc drives these units do not contain a removable storage medium, indeed this is the reason for the large capacity and incredible reliability of these units. When attached to a BBC computer these units provide either 20 or 40 megabytes of storage (20,000 or 40,000 Kilobytes) when formatted to ADFS standards.

Streamer Archiver

This tape based unit gives hard disc users the ability to archive the whole of a Winchester Hard Disc Drive on only two or four data cassettes. The software supplied allows you to store a file, a directory or all the files on a disc. This means that you will save space on the streamer cartridges when your Winchester Hard Disc Drive is only partially filled.

Chapter 2

Introduction to Disc Drives in general & Floppy Disc Drives in particular

2.1

New users start here!

This chapter is a general introduction to the subject of 51/4 inch floppy disc drives without being too specific about their use with the BBC machine.

It would be easy to assume that someone who had bought a memory backup device is fully conversant with the technology and operation of the, industry standard, 51/4 inch floppy disc drive unit, which is one option of this system. However, it is perfectly possible that there are those who have never used such a drive and therefore this chapter will introduce the floppy disc, its care and its operation to all those who are new to the unit. Those who have used such drives before are asked to skim, or skip, this chapter and go straight onto the chapters which deal with the technology that is new to them.

2.2

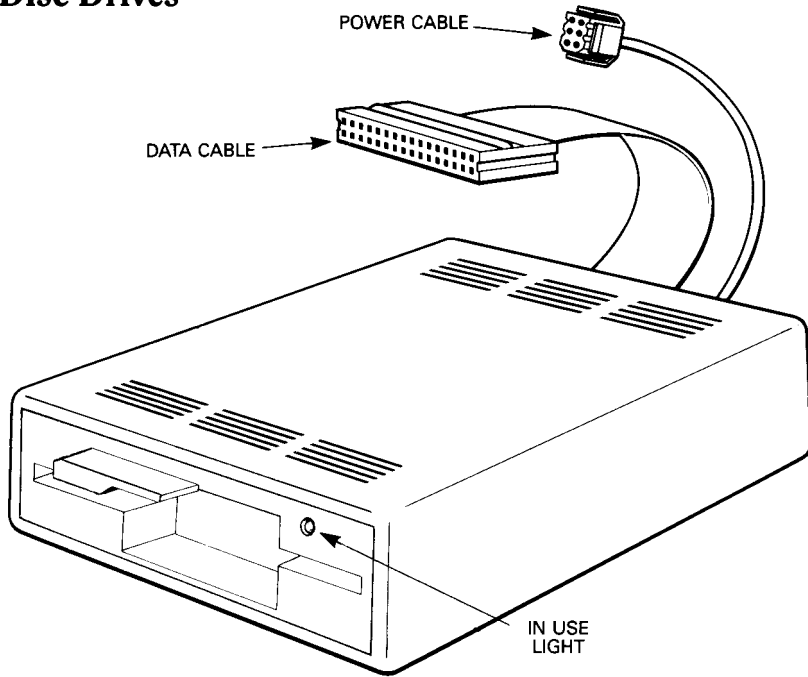
Introduction to disc drives and discs

All modern computers contain a certain amount of memory, or RAM as it is known, which will hold information very reliably when the machine is switched on but which disappears when the electrical supply is switched off. This type of memory is known as volatile and there is very little that you can do about this situation unless you save the memory contents before you switch the machine off.

In the standard BBC machine this is done by saving the information to a cassette tape but with the disc interface and the Disc Drives the floppy disc becomes the storage medium. If you are to get the full use of your machine

it is essential that you understand a little about the drives and the disc interface and as there are a certain number of special words that are used to describe the parts of the discs and drives we will start by explaining those.

Disc Drives



The drive itself is actually much simpler than a cassette recorder, although built from very high precision components, and has very few parts that you need to know about.

The drive aperture is where you insert the disc. The disc should always be inserted with the label uppermost and with the oval window towards the rear of the unit, ie the disc is inserted oval window first.

The drive door can be of differing shapes but always has the same purpose. When you close the drive door, or turn the lever in the case of some drives, it has the effect of clamping the disc and preparing it for use.

The in use light is only lit when the computer is ready to read or write from the disc in the drive concerned. if this light comes on and the door is open there will be no operation performed until the door is closed. It is good practice to always let this light go out before opening the drive door to remove the disc. It often stays lit for a second or so after the computer has finished its operation but this is to re-settle the disc and should always be allowed to continue.

The power cable is connected by means of a plug-in lead to the 240 volt power source, usually a 13 amp socket. These units contain their own power supply and therefore require no connection to the BBC's auxiliary power socket.

The data cable is connected to the BBC via the socket underneath marked "Disc Drive". This "idc" connector needs to be pushed very firmly home so that the two retaining clips at the side are holding it in completely. If this is not done there is a chance that any of the drives in your units will show strange errors.

The other "idc" connector, present in those units with a Winchester Hard Disc Drive, is connected to the 1 Mz Bus socket on the underside of the BBC's main housing. The instructions for connecting this cable are as above.

There is also a 40/80 switch on the face of the Floppy disc drive. This is the track density selector switch and one position gives a track density of 40 tracks across the disc surface whilst the other gives one of 80 tracks across the same distance. You will not be able to read 40 track discs if this switch is in the 80 position and vice versa (unless you use the special *DRIVE command which can allow you to read 40 track discs in an 80 track drive — this is fully explained in your ADFS manual).

Drive numbering

The disc drives are each assigned a number and can be called by this number when using the ADFS commands. The numbering system is a little strange and takes a little getting used to.

Please note that the numbering system used when a Winchester Hard Disc Drive is connected is different to the numbering system used with ordinary floppy disc drive units. The following numbers assume that at least one Winchester Hard Disc Drive is connected to your BBC system.

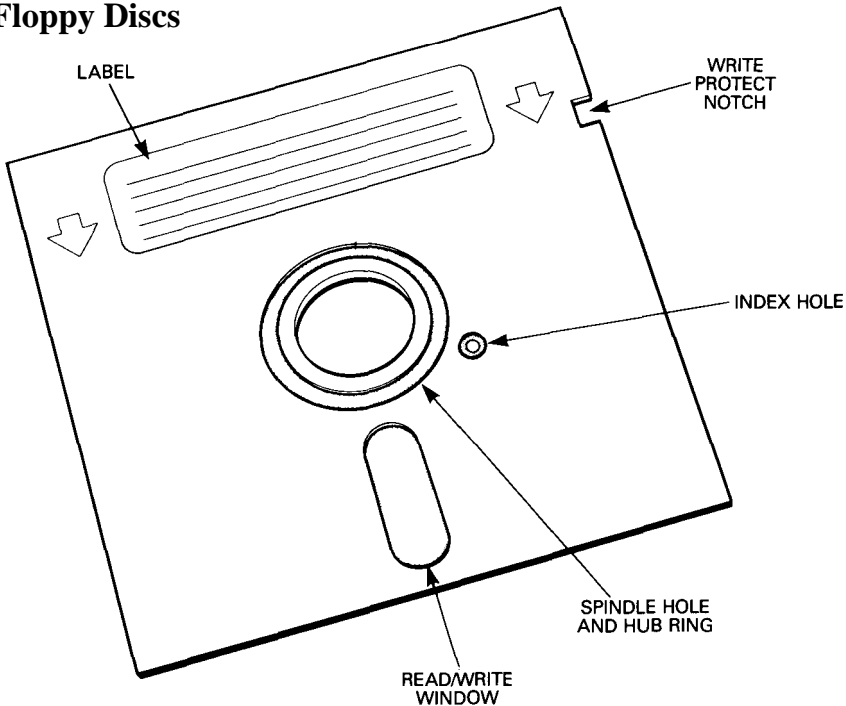
If you have just one Winchester Hard Disc Drive this will be addressed as Drive 0.

The first floppy disc drive is addressed as Drive 4 and the second floppy disc drive as Drive 5.

For details of the drive numbering system without a Winchester Hard Disc Drive please see Appendix A which is provided for the sake of completeness.

2.3

Floppy Discs



The disc itself has more parts that you need to learn the names of than does the drive.

The read/write window is the area of the disc that the drive uses to read and write its data. It is the direct equivalent of the exposed tape that you see if you don't rewind a cassette before you remove it from the recorder. It is vital that you never touch any part of the recording surface of the disc including the part that shows through this window. Any mark on the disc surface including a finger print can corrupt the disc and can make it impossible for you to recover the data, programs and files that you recorded on the disc.

The label has an obvious purpose in that it provides a method of indexing the disc and its contents.

The spindle hole and hub ring are where the disc is clamped and spun by the drive. The ring is a reinforcement of the disc as they can wear in high usage situations.

The index hole is very important to the drive mechanism itself as it is used to determine both the speed of the disc and the physical start of the data on each track.

The write protect notch is provided to give you a method of preventing the disc from being erased. It is rather like the lug on the rear of a cassette that can be removed to prevent any further recording. If this notch is covered then the disc cannot be written to again, ie it can only be read from. Only if this notch is uncovered can the disc be written to.

2.4

Disc interfaces

Before a computer can use a disc drive a number of components need to be fitted to the machine. These might be fitted inside the case as in the BBC system, or could be added in a separate box or even within the drive casing itself.

The components are usually chips and they allow the brains of the machine to use the storage that the disc contains.

In the case of the BBC this interface amounts to about 10 chips and, as the machine was intended to have this facility from the design stage, the space was left on the main board for all these components. Indeed the BBC B+ and the Master models have the disc interface fitted as standard. For all the BBC B models there is no external difference between the disc based and cassette based machines. The only way that you can demonstrate that there is an active disc interface within a machine is by switching on the computer and reading the sign on message. This message will look something like this:

Group A

BBC B with 1770 & ADFS:	BBC B+ with ADFS:	BBC Master (ADFS selected):
BBC Computer 32K Acorn ADFS BASIC >	Acorn OS 64K Acorn ADFS BASIC >	Acorn MOS Acorn ADFS BASIC >

or like this:

BBC B with 8271 DFS:	BBC B with 1770 DFS:	BBC master (DFS selected):
BBC Computer 32K Acorn DFS BASIC >	BBC Computer 32K Acorn 1770 DFS BASIC >	Acorn MOS Acorn 1770 DFS BASIC >

Please note: If you have any other 'sideways ROMs' fitted then they are likely to have their own sign-on messages between the first line and the last line shown here.

The reason for the distinction between the groups is that Group A are ready for connection to the memory device unit and Group B are not. In chapter 1 we explained the minimum specification that is required for each BBC computer model to be used with a Winchester Hard Disc Drive based system. The sign-on messages shown in Group A have the required specification and those in Group B have not. If you are in any doubt about your computer please contact the dealer who supplied this unit and they will help you to correct the situation.

These sign-on messages indicate that the disc interface is active and that any loading or saving will be directed to the disc unless you specify otherwise.

There is a mistake of jargon that is often made at this point. It is very easy to fail to distinguish between a disc interface and a disc filing system. The disc interface, as described above, is a whole collection of chips that allow you to use the drive. One of the most important of these, and the one that affects you most, is the disc filing system chip itself, which in the case of a Winchester Hard Disc Drive system has to be an ADFS chip.

A Disc Filing System controls the action of the drive and allows you to tell it exactly what you want it to do from the keyboard. This sort of control is provided on a cassette recorder using the keys. If you want it to record you press the record key, etc.

Instead of this type of physical control we use a piece of firmware, ie a program, that is written into a chip. Other machines use a program on the disc itself but this wastes space on each disc and so the BBC design has this on a 'sideways ROM', a chip inside the machine that is always available for use when the machine is switched on. In order to give the machine its commands we use a star or asterix, *, and all these commands are passed to the chip required to take the action.

There is no way that a disc filing system ROM can work without the other support chips in the full disc interface nor can they work without a disc filing system ROM. What you can do is change the disc filing system ROM without changing the other chips. Acorn themselves have done this and there are currently three different disc filing system ROMs in use on BBC machines. The essential requirement for you to be able to use your new memory device is that ADFS is fully functioning within your machine.

2.5

Discs themselves and their use

If you remember the diagram earlier in this chapter, you will recall that the disc is a magnetic circle of plastic that revolves around a spindle so that you can write data to it and read data from it very quickly.

In much the same way that you would draw a chart in order to fit numeric data into a tabular form, the computer needs to draw its lines on the disc ready for it to write its data. This is done by a process called formatting and it allows the machine to find all its information easily just as your table might have done. This formatting can be done in a number of ways. For some computers the discs have a series of index holes, usually 10 or 16, which mark off the sections. Others have just one hole and expect to have the information marked into sections magnetically either by the user or at the factory. Each disc for the BBC system comes with all its space completely unorganised ie unformatted. This means that before you can use any disc you must format it using a special program. These discs are known as soft sector and you must be careful never to buy hard sector discs for your BBC for they will not work.

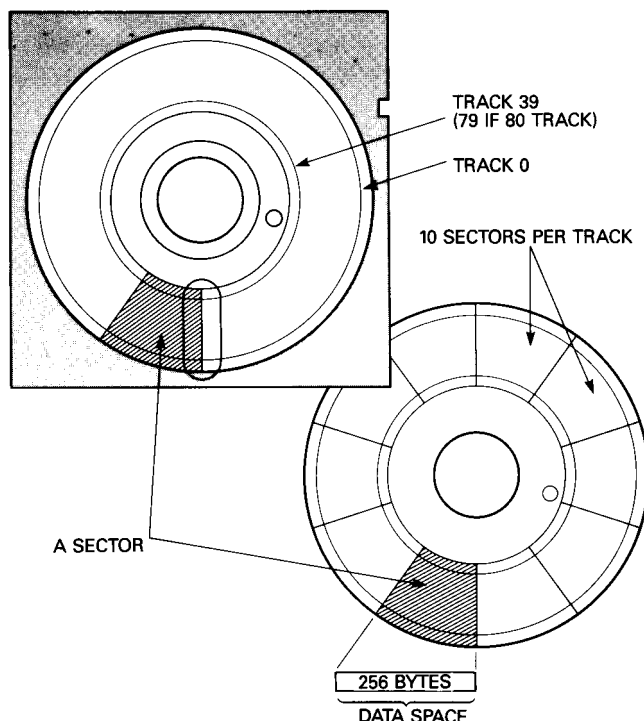
Often the formatting programs give you the choice of formatting drives to 40 or 80 tracks. This can confuse the first time user and so a few words on the subject might be in order.

If you have a 40 track disc drive then there is really only one choice, you must always use a 40 track formatting program. If you insist on using an 80 track formatting program then you are forcing the drive head to try to move out further than it can and this causes it to hit the endstop, rather like the buffers on a railway track. Just as you wouldn't expect the train to hit the buffer deliberately the drives shouldn't hit the endstop unnecessarily. If you always use the 40 track formatting program this shouldn't occur at all.

If you have an 80 track drive then the choice is also very simple. You need to use an 80 track formatting program. If you use a 40 track then you will have half of each disc unused. Whilst this is not as great a problem as the one mentioned above it is quite silly to have such an amount of unused space.

If you have a 40/80 switchable drive, as supplied as part of the memory device range, then you have the capacity to use both programs when appropriate. If you have the switch in the 40 position then use a 40 track formatter and use the 80 track program when the switch is in the other position. You can also make both of the mistakes detailed above so do check the switches and change them according to your current needs.

The ADFS system which is required to run your Winchester Hard Disc Drive uses a special formatting program which formats your floppy disc in several different ways. For most purposes the better format choice is 80 track "long" discs as this gives you the largest space on each disc.



The formatter records a series of identification markers onto the disc to show the beginning and end of each part of the surface. The disc is 'marked out' into either 80 (or 40) tracks per surface of 16 sectors each.

A track is best described as a ring around the surface of the disc. They are concentric rings however not spiral ones as on a musical record. This means that the head can move from track to track by stepping into or away from the centre. As the disc spins at a rate of 300 revolutions per minute it means that the head can get to any particular point on the surface within a fraction of a second. These rings aren't grooves however; they are just magnetic 'marks' and it is these that you are writing to the disc during the formatting process.

The sectors can best be described as slices cut from the rings that are the tracks. Each track has just 16 of these sectors and each one actually holds 256 bytes of information. Those who have used the cassette filing system will recall that this is the length of each block when loading from disc. The sectors each have their own marks and a program can start at the beginning of any of these sectors. There is no way that the computer can find its way to a program part way through a sector so any part of a sector that is not used by the program is effectively wasted.

The final process that occurs during formatting is that the catalogue area of the disc is cleared and prepared for use. This information is rather like the contents page of a book, we need to store both a program's name and its location on the disc. The DFS writes the information required to the disc every time a new program is saved. It also changes the information if you delete a program or change the disc in other ways.

2.6

Using the disc drives and DFS for the first time

In this section we are going to try to take you through your first session with the drive and the Floppy disc drive. We presume that you are sitting at the BBC and that you have connected the drives correctly as described above.

You will need the following items in front of you:

BBC with disc interface, switched on

Disc drive units fully connected to both mains & BBC computer

Monitor, switched on

Utility disc, usually supplied with a drive

Blank disc/s

Note book, to jot down any important discoveries that you feel that you might need to remember

and

This book.

The first thing that you will need to do is check that the drive is working correctly. One simple way to do this is to type:

```
*MOUNT 4 <RETURN>
```

You should notice the light on the drive unit light up and a whirr coming from the drive. Don't leave it too long before pressing BREAK. You are unlikely to damage anything by leaving the drive whirring but put it out of its misery to start with.

If this led lights correctly then it is safe to proceed and you can read on. If it stays dark then you need to re-read the previous sections and check all the connections that you have made between BBC and drive.

2.7

Formatting the disc

Before you can write anything to any disc it needs to be formatted as detailed above.

On a BBC computer with ADFS you use a formatting program provided on disc. As an example I shall describe how to format a disc using the AFORM program.

Firstly you should insert the utility disc into the Floppy disc drive and close the drive door. Then with your finger pressed firmly on the SHIFT key you should press the BREAK key (using a different finger) and release the BREAK key before you release the SHIFT key.

This will provide you with a 'menu' from which you can select the various options that you need. In this case we need to format the disc and this means that we need to select the option for utilities and from that menu the option for formatting. This will start to load and run the formatting program and will give you the chance to select the disc surface which you wish to format and the option of 40 or 80 tracks. Choose the appropriate track density for your drive and insert the disc that you wish to format.

You should then be given a read-out of the track being formatted. In order to ensure that each track is formatted correctly it is verified as soon as it has been written. This means that the program checks the track to ensure that there are no physical difficulties and that it should work well in the future. If there are any problems this will be indicated by the program — it will stop with a message showing the problem track number.

Most formatting programs work in a similar manner and you can use almost any of the various versions with very little alteration in these basic procedures. There are two vital things to remember for the future.

1) Formatting a disc wipes the surface clean. The process used is to fill the disc surface with &E5 bytes and then write 0 bytes into the catalogue. If there is anything on a disc that you need to keep you should NOT re-format it or all the information stored will be lost. Don't re-format the utility disc that you were given when you bought your drive. This will be needed on a regular basis and is very important indeed.

2) Always try to keep a formatted disc in your collection somewhere. Just like it is always difficult to find a blank tape when you need one, it is always hard to find a formatted disc too. The reason that it is more important to have a formatted disc than a blank tape is that the very act of running the formatter itself will wipe your program (yes the one that you wanted to save) out of the memory. You are therefore advised to format all your discs as soon as you buy them rather than to wait until you need the disc to store a program.

3) Discs formatted on the old Acorn DFS will not work with ADFS and vice versa. These two systems use a different method of keeping the information on the disc and each systems cannot read the information from the other. This

means that if you wish to pass a disc to someone else with a BBC computer you need to ascertain the type of system they are using before formatting and then copying the files to the disc.

There are a number of special programs which can transfer a program from a DFS disc (single density) to an ADFS disc (double density) but you need to have both chips in the machine at the same time in order to use these programs.

2.8

Saving and loading programs

The next most obvious task for a new user to try is that of writing a program to the disc and then trying to read it back into memory.

Using this aspect of ADFS is likely to be simplicity itself for the commands used are those that you have used before when storing your programs on cassette.

The first task is to get a program into memory and we suggest that you should use a simple test program such as the one below. You might need to type NEW followed by <RETURN> before you type in this program. This ensures that there is no other program in memory.

```
10 REM SIMPLE TEST PROGRAM
20 PRINT "This is a success"
30 END
```

'Ib make sure that ADFS knows which drive should be used for the next series of instructions type:

```
*MOUNT 4
```

This makes sure that the disc in the Floppy disc drive is ready for any further program operations.

'Ib save the program to the disc simply type the following line.
SAVE "TEST" <RETURN>

The drive should whirr and the light flash on for a very short time. Then you have saved your program to the disc.

As a quick check you could type the following two commands.

```
*CAT
*INFO $.*
```

The first should give a similar output to the one below:

```
(1) MFM
Drive0          Options0(Off)
Directory:0.$
Library:0.$
```

TEST

Whilst the second should look like the output below:

```
$.TEST          FF1900 FF8023 00006C 002
```

There may be minor variations but the output printed above should give you the general idea.

The first command was used to give you a CATalogue of the disc. You can use this command on the cassette filing system too but it takes a great deal of time and simply gives you the names of the programs on the tape. On the disc system it gives the information in a slightly different format which is fully explained in Chapter 4.

The second command is a request for information about the files on the disc. It is nearly equivalent to changing the file information reporting on the cassette filing system by using *OPT 1,2. It gives the load address, start address and the length of the file. The last number is the sector where the program starts but there is no need to let this concern you at this stage.

If all has gone well then you should be ready to try re-loading the program from the disc.

If you want to prove that you really are re-loading the program then it might be a good idea to switch the machine off and on again so that you can be certain that the program really has loaded correctly. A word of caution though. When you switch on a machine like a computer there can be a surge of power to the various parts of the system. This can be transmitted down the data cable to the drive unit and has been known to corrupt the data on discs. In order to prevent this ever happening to your disc it is good practice to get into the habit of removing the disc from the drive before you switch the mains off or on. It is a good idea to always make sure that the drive door is open and the disc partially removed.

The command LOAD works with the drive system in just the same way as it does with the cassette filing system with two notable exceptions. You cannot LOAD files from a disc without using a file, name. On a cassette system omitting the filename allows you to load the next program that occurs on

the tape. As the speed of drives is such that all the programs are immediately accessible you cannot just load the next one that comes along. You have to specify the file name on every occasion.

The other difference is that the system doesn't distinguish between upper and lower case letters in the same way that the cassette system does. This means that the following file names are all thought to be the same file by the DFS.

FRED
fred
Fred
FrEd etc.

A feature of this that may not be apparent at first is the inability to save two programs with the same name to the same disc. The ADFS wouldn't be able to distinguish between them if you were allowed to do so.

So to load the file you need to type the following line:

```
LOAD "TEST" <RETURN>
```

Once again the drives are likely to whirr and then the computer should respond with its normal 'ready' prompt (>) . Try LISTing the program just to check that it is all there. You can then RUN it should you so wish. You could use the CHAIN command to load and run if you prefer.

As you can see using drives isn't as difficult as you might at first assume and we could even argue that they are simpler than cassette recorders. What we haven't covered in this introduction is the extra facilities that the drives and their DFS can offer to you. These will all be covered in later chapters but for the moment we would suggest that you content yourself with trying to load and save your own programs until the procedure becomes automatic.

Chapter 3

Winchester Disc Drives

3.1

What is a Winchester Hard Disc Drive?

As you will have gathered if you read Chapter 2 of this manual the first type of disc drives which were available for attachment to the BBC computer system were Floppy disc drives but it soon became obvious that some users, particularly those in business or in education, needed a capacity far larger and an access speed far faster than those provided by the 5 $\frac{1}{4}$ inch floppy disc drive. The Winchester Hard Disc Drive offers both of those advantages.

The reason that a Winchester Hard Disc Drive can provide both extra capacity and the fantastic speed increase is that the drive is sealed!

Inside your Winchester Hard Disc Drive unit are up to two 5 $\frac{1}{4}$ inch hard discs and up to four read and write heads. These drives spin at a faster speed than the Floppy disc drives — in fact over 10 times faster than the 300 rpm of the Floppy disc drive. This gives them the incredible load and save speed that you will have noticed on changing from the floppy drive. They also use a different density of magnetic coating that allows the data to be packed very closely together on the disc surface. Another major difference is that the disc spins continuously whenever the drive is powered so that there is no need to wait for the drive speed to be correct before reading the information, as there is with a floppy disc drive. Finally, the sealed enclosure means that the risk of any dust or other foreign body entering the drive is lessened, aiding reliability.

Apart from these few differences the Winchester Hard Disc Drive is identical in operation to the floppy disc drive considered fully in Chapter 2.

3.2

Connecting your Winchester Hard Disc Drive

The Winchester Hard Disc Drive unit takes its data from the 1MHz BUS socket on the underside of your BBC computer. The drive unit has a ribbon cable labelled 1MHz BUS which should be plugged into the appropriate

socket with the locating lug towards the BBC's top surface. It is, just, possible to connect this plug the wrong way up but when connected in the correct fashion the plug moves home smoothly, so if any resistance is noted you are probably doing something wrong!

After connecting the data cable the mains cable can be connected to a nearby 240 volt ac socket (probably a 13 amp socket) and the mains switch can be operated. If all is well you will notice a whirring sound which gathers in speed and pitch for a few seconds. Do not be alarmed at this noise it is just the cooling fan and the drive motor accelerating to working speed.

3.3

Care of your Winchester Hard Disc Drive

Your Winchester Hard Disc Drives are extremely reliable and give exceptional service in normal usage. However, they are sensitive to excessive vibration and can react badly to knocks. Like ordinary Floppy disc drives the magnetic surface is deteriorated by excessive heat, moisture, direct sunlight, magnetic fields and dusty conditions. In short any circumstance which would make a normal human being feel in any way uncomfortable is likely also to make your Winchester Hard Disc Drive feel uncomfortable too.

Finally, it should be noted that the drive should be as level as possible on a horizontal surface with the ventilation apertures of the unit fully uncovered at all times.

If you intend to move the Winchester Hard Disc Drive after a working session please use the *BYE command at the end of that session. This stores all open file buffers onto the disc surface, closes these files and then moves the head assemblies into a "Shipping position" which helps to protect them from any minor jolts or vibrations.

3.4

A few technical details

These Winchester Hard Disc Drives come in two capacities, nominally 20 megabytes and 40 megabytes (1 megabyte is 1,000,000 bytes or alphanumeric characters). Translated into A4 pages of typing this means that the 20 megabyte drive can store about 10,000 pages of text at any one time. Not quite enough for the Bible perhaps but a huge amount nevertheless.

Those who have purchased the Drive 1 additional Winchester Hard Disc Drive should connect their drive to their previous Winchester Hard Disc Drive (drive 0) using the "Drive Expansion" connectors on the back of drive 0 and the cables provided with drive 1.

The discs are divided into tracks and 256 byte sectors like Floppy disc but there are 33 sectors per track and 612 tracks per disc surface, a considerable increase on the floppy disc drive's 80 tracks and 16 sectors per surface. The drive unit is factory formatted and should not need to be reformatted unless you find that the system persists in giving the disc error message:

Disc error 1C

whenever the drive is started from cold. If you find this to be the case return the drive to your local dealer for service. Please understand however that reformatting the disc surfaces for whatever reason wipes the information stored.

3.5

Maintenance of your drive

This unit does not require any periodic maintenance and there are no user serviceable parts.

Due to the high precision of the components in this unit it should not be open or tampered with in any way. Any such action automatically invalidates the guarantee.

Chapter 4

Streamer Archiver

4.1

What is a Streamer Archiver?

Put in very simple terms a Streamer Archiver is a method of backing up your Winchester Hard Disc Drive so that any important files can be retrieved.

There are a number of reasons why such a process might be important to a user of the system:

- i) A certain file might need to be stored in its state on a particular date — for example a database or accounting datafile.
- ii) Files under development may need to be saved as an insurance against subsequent erasure, accidental or otherwise — for example the work of an examination student which needs to be submitted and assessed as part of the qualification concerned.
- iii) Cautious users might want to be sure that no kind of system failure can damage their business or occupation and the small cost of regular backups is nothing compared with the high cost of any such failure.

It should be recognised however that the Winchester Hard Disc Drive supplied as part of your memory device is incredibly reliable and that it can be used for very long term storage without any significant risk of data loss. Indeed we know of a professional author who uses a Winchester Hard Disc Drive to hold the text of all 15 books he has written.

4.2

Tape Cartridges and their use

The Urwin streamer provided as part of this system uses special tape cartridges which are available from your local dealer.

To load a cartridge remove the tape unit from the protective plastic case and insert the cartridge into the streamer unit with the exposed roller edge towards the streamer, ie so that the roller enters the unit first, and with the metal surface face down.

As the cartridge is pushed home you should hear and feel a definite "click" if it seats correctly within the aperture. If you meet any resistance please remove the cartridge immediately pushing the eject bar underneath the

aperture if required. Re-insert the cartridge as described above until you hear the click.

With the power supply switched on the drive will automatically position the tape to its start which causes the "busy" light on the front of the unit to illuminate. This should not cause you concern as it means that the tape will be ready for your immediate use at a later time.

To remove the cartridge for any reason press the eject bar. Please note that this bar should not be pressed during a read or write operation. If you want to stop such an operation please abort the software, usually by pressing ESCAPE, and wait until the busy light extinguishes.

4.3

How the Streamer Archiver works

This tape drive unit uses special digital tape mini-cartridges each of which can store up to 10.3Mb of data. The data is compressed onto the tape so that unused parts of the disc surface don't waste tape.

The data is recorded on several data tracks the first running from the head (start) of the tape to the tail (end), the second track runs from tail to head and so on.

Each tape has to be formatted before use by the recording of two patterns, the first of these is a servo pattern which gives the tape its incredible speed and data reliability and the second is the tape formatting itself. Both these patterns are written and verified by your dealer before the cartridge is supplied to you. This means that every cartridge has already been fully tested before supply and can be relied upon to give outstanding service.

When the tape is used for backup (recording) or restore (reading) operations there is an automatic verify procedure which, during recording, checks that the data on the tape is an accurate copy of the disc files and, during reading, that the disc is an accurate copy of the tape file. If any bad blocks are found they are skipped over during write operations and re-read several times in an attempt to obtain the data during read operations. Bad sectors and tracks on the disc are similarly avoided.

4.4

Caring for tape cartridges

This Streamer Archiver uses special tape cartridges which have been pre-

formatted with a speed regulatory pattern not supplied on ordinary blank cartridges. For this reason it is essential that you contact the dealer who sold you the unit for extra cartridges and don't use standard DC-100 cartridges which will not work and will also invalidate the unit's guarantee.

Once the data from your drive is written onto a cartridge you can be assured that it is stored there in a non-volatile form which is likely to be preserved for longer than the lifetime of the person who recorded the data. There are a few storage tips which need to be observed.

Never open the tape access flaps or touch the tape itself
— a single fingerprint can prevent the data from being read from all the tracks

Keep the cartridge in its protective box when not actually in the tape drive.

Keep the cartridges away from all electro-magnetic fields
— telephones, dictation machines, speakers, calculators and bulk tape erasers all contain strong magnetic fields.

Protect the cartridge from heat sources at all times, radiators, windows, warm air ducts and lamps.

Don't place cartridges on your computer's visual display unit or near the computer power supply.

4.5

Write protecting a cartridge

If a recording, whether of a single file or a whole disc, is particularly valuable you should write protect your data cartridge so that no further write operations can be performed.

On the front of the cartridge's top surface, near to the central roller, there is a plastic tab which can be pushed towards either the cartridge edge or towards the centre.

With this tab positioned towards the centre the cartridge is write protected and no further recordings can be made. With the tab pushed towards the edge of the cartridge it is write enabled and further recordings can be made. The software supplied with this unit cannot override this setting for your own protection, therefore messages may be issued telling you to insert a write enabled cartridge.

4.6

The Streamer Archiver software

Supplied on a floppy disc with your Streamer Archiver is the driver software for your new unit. This software is very user-friendly and will enable you to backup your Floppy disc drive or Winchester Hard Disc Drive with utmost simplicity. These notes are provided mainly for reference and should clear up any slight difficulty you might have.

Software versions

Due to the inherent differences between the various BBC Computer models three versions of the software are provided. There is no operational difference between the versions but you should be careful to use the right version for your machine:

Model B owners should use ARCIVEB

Model B+ owners should use ARCIVEP

Master owners should use ARCIVEM

It is vitally important that you keep at least one copy of this software on floppy disc, although it will normally be used from the Winchester Hard Disc Drive. The reason for this is that a reformatting of the Winchester Hard Disc Drive will wipe the software and if the re-formatting was done ready for a restore of the contents from cartridge, you will then be unable to use the tape drive as the software has been wiped. For this reason alone it is worth keeping at least two floppy discs containing the software.

4.6.1

Running the program

Whether run from floppy or hard disc the software is initialised using the *RUN command, eg:

```
*RUN ARCIVEB
```

```
*/ ARCIVEP
```

or even

```
*ARCIVEM
```

Please note *RUN , */ and * followed by a command name are all equivalent forms of the *RUN command.

This will lead to the main menu which displays the following options:

Backup from disc to tape

Restore from tape to disc

Tension tape

Quit

4.6.2

Backup from disc to tape

Pressing "B" starts the backup sequence and allows you to specify whether you require to backup from ADFS or NETwork filing systems. Then you select the drive number from which to backup before moving to a second menu screen as follows:

1 Backup all files on disc

2 Backup a directory

3 Backup individual files

Q Quit

Selecting option 1, ie pressing 1, starts the streamer drive and then takes every file on the disc and writes them to tape. If the Winchester Hard Disc Drive is being backed up then it is possible that more than one cartridge will be required so have enough formatted cartridges ready. They are recorded in a sequence and it is important that the sequence numbers are written on the cartridges so that they can be inserted in the same order during restore operations.

Option 2 prompts you to enter the directory pathnames required and then asks if subdirectories are to be included. The notes about cartridge length given above may apply here also.

Choosing option 3 prompts you for a list of file names which must be full path names (ie the root directory, subdirectory/ies and file name must all be specified — further details are given about path names in your ADFS manual) . If you press RETURN at the end of the list this terminates the option.

The only error messages that you are likely to encounter during backup are self explanatory and include:

Insert write enabled cartridge

Bad filename

Bad directory name

The name errors are caused by not being meticulous about specifying full pathnames.

If you are using a data cartridge that already has some information written to it you will be asked if you want to overwrite this data. You should only respond "Y"es if you are convinced that the new information is more important than the old recording.

4.6.3

Restore from tape to disc

Pressing "R" from the main menu takes you into the restore operations and this also prompts you to specify filing system, ADFS or NETwork and drive number.

The menu displayed at this point is:

1 Restore all files on tape

2 Restore a directory

3 Restore individual files

Q Quit

All these Options take cartridges, in sequence if necessary, and restore each file and or directory to the selected disc drive. If a file of the same name as one being restored exists already on the disc and is "locked", ie software write protected, you will be asked if you are sure that you want to overwrite the file. Please note: To save you time and effort if you have corrupted only one file or directory it is a simple matter to restore only that file, even if the original recording was of a whole disc. This should be the normal way to recover from errors as it is less likely to corrupt other files altered since the last backup was made. It is perfectly possible to restore a single file, group of files or a directory from a tape which is not first in the recorded sequence.

There is no need to use the *CDIR command to create directories for the programs that you are restoring to the Winchester as this function is built into the software supplied.

4.6.4

Catalogue backup tape

If you are uncertain which tape in your collection contains which file this option, selected by pressing "C", allows you to see the file name, load address, exection address and file length of each file recorded onto the tape.

4.6.5

Tension tape

There are occasions when a tape can give errors of one type or another due to the tape tension slipping slightly. This option, triggered using the letter "T", takes the tape to the start, winds to the very end and then returns to the start again.

This leaves the tape in a correctly tensioned state and can be used to eradicate such errors. Please use this option if you ever have an error message given by the software.

4.6.6

Quitting the program takes you back to the BASIC command mode

If you have any queries about your Streamer Archiver or its associated software please refer them to the dealer who supplied the unit and they will be very willing to help you.

Appendix A

Drive numbering under DFS

When DFS is active the drive numbering explained in Chapter 1 does not apply.

DFS can only be used with Floppy disc drives and not with Winchester Hard Disc Drives, therefore these numbers only apply to Floppy disc drives used with DFS.

Standard Acorn DFS systems, often based on the obsolete 8271 Floppy Disc controller chip, can support up to four disc drives numbered 0 to 3.

Unlike ADFS systems a single drive unit used with DFS can be addressed as two physical drives, ie one surface of the disc is regarded as one drive and the other surface as a completely different drive!

Drive 0, usually the first drive attached, often the left drive in a horizontal unit or the lower drive of a vertical unit. The actual surface addressed as Drive 0 is the lower surface of this drive unit.

Drive 1 is the second drive (right hand or top) and the lower surface of this drive.

Drive 2 is the opposite, ie top surface of the first Drive unit. This is only present and addressable on double sided drives.

Drive 3 is the top surface of the second double sided drive unit.

This numbering system means that a single double sided disc can be addressed as DRIVE 0 and DRIVE 2 or as DRIVE 1 and DRIVE 3 depending upon which unit the disc is presently in.

This table may make things more clear:

Units Present	Drives Present
One Single-sided drive	DRIVE 0
One Double-sided drive	DRIVE 0 & DRIVE 2
Two Single-sided drives	DRIVE 0 & DRIVE 1
Two Double-sided drives	DRIVE0, DRIVE1 DRIVE2 & DRIVE3



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