

Cambridge Workstation



WELCOME
GUIDE

ACW Welcome Guide

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Important Information

Wiring the Mains Plug

WARNING: *The Acorn Cambridge Workstation must be earthed.*

The wires in the mains lead are coloured in accordance with the following code:

<i>Green and yellow</i>	Earth
<i>Blue</i>	Neutral
<i>Brown</i>	Live

As the colours of the wires may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

- The wire which is coloured *green and yellow* must be connected to the terminal in your plug which is marked by the letter E, or by the safety earth symbol or which is identified by being coloured green, or green and yellow.
- The wire which is coloured *blue* must be connected to the terminal which is marked with the letter N, or coloured black.
- The wire which is coloured *brown* must be connected to the terminal which is marked with the letter L, or coloured red.

If the socket outlet available is not suitable for the plug supplied, the plug should be cut off and the appropriate one fitted and wired as previously noted. The moulded plug which was cut off should be disposed of as it would be a potential shock hazard if it were to be plugged in with the cut off end of the mains cord exposed. The moulded plug must be used with the fuse and fuse carrier firmly in place. The fuse carrier is of the same basic colour (though not necessarily the same shade of that colour) as the coloured insert in the base of the plug. Different manufacturers' plugs and fuse carriers are not interchangeable. In the event of loss of the fuse carrier, the moulded plug **MUST NOT** be used. Either replace the moulded plug with another conventional plug (wired as previously described) or obtain a replacement fuse carrier from an authorised Acorn dealer. In the event of the fuse blowing, it should be replaced, after clearing any faults, with a 5 amp fuse that is ASTA approved to BSI 1362.

Exposure

Like all electronic equipment, the Acorn Cambridge Workstation should not be exposed to direct sunlight or moisture for long periods.

Warning

Do not remove the casing even after switching off, as high voltage may remain.

Protecting the Winchester Disc

To avoid damage or data loss, do not move the Acorn Cambridge Workstation (ACW) while it is running. The ACW must always be moved gently, and not tilted rapidly, or turned on its side.

After using the ACW, the heads must be moved to the parking zone before switching off the mains power. The exact command that needs to be used to park the heads will depend on which program is in control. For instance:

From BASIC (either 32000 BASIC or 6502 BASIC) type:

```
> *bye
```

From Pandora type:

```
*bye (the * is supplied by Pandora)
```

From Panos type:

```
-> .quit (to return to Pandora), before typing:  
*bye
```

In each case, the relevant prompt is shown, in addition to the characters you actually type.

Transportation

If you need to transport the ACW, pack the original protective expanded polystyrene around the sides of the machine, keeping the ACW in the upright position. Lower the combined package carefully into the cardboard box in which the machine was supplied, again, making sure that the ACW remains upright.

User Registration

A User Registration Card is supplied with the hardware. It is in your interest to complete and return the card. Please notify Acorn Computers Limited if this card is missing.

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1. Introduction

Function of this guide

At first this guide describes how to unpack and set up the workstation, and how to install the software.

Secondly, an overview of the hardware and an introduction to the operating system, the filing systems and the programming languages supplied with the machine, is given.

This Welcome Guide forms a brief introduction to the ACW. There are many other documents available to answer specific questions and provide further information; a list of this material is given in the last part of this manual.

The ACW Model 443 has one Winchester disc drive and one floppy disc drive.

Conventions observed in this guide

The following conventions are observed:

- (1) **BREAK** **RETURN** **ESCAPE** **SHIFT** and **CTRL** signify the corresponding keyboard keys rather than the actual words. It is assumed that command lines are terminated by **RETURN**. Refer to the keyboard diagram for actual symbols used on these keys.
- (2) In examples where commands have to be typed in response to a prompt (e.g. the Panos prompt '->'), both the command and the prompt are shown; for example:

```
-> cat -help
```

2. Getting Started with a New System

2.1 Unpacking

First, check the contents of the box against the packing list supplied. In the unlikely event of there being any deficiencies, contact your supplier immediately.

It is advisable to retain the packing material for possible future use.

2.2 Setting Up

The main unit should be placed on a firm level surface. The mains lead should be connected to a mains supply having an earth connection. If the moulded plug supplied with the ACW is unsuitable for the local mains socket, follow the instructions on fitting a new plug given under *Important Information* at the beginning of this manual.

The free end of the keyboard lead plugs into the socket marked 'keyboard', at the rear of the main unit. As it is plugged in, press the 'release' tab on the keyboard connector and check that the connector is locked in place securely.

2.3 Installing the Software

The ACW is supplied with the Pandora operating system kernel program in Read Only Memory (ROM), along with the ADFS and NFS filing systems and terminal emulator firmware. A single processor (6502) version of BBC BASIC and the DFS filing system are also supplied, to provide compatibility with the standard BBC microcomputer system.

The rest of the software is supplied on floppy discs. The installation procedure describes how to transfer this software from floppy disc to Winchester disc. When a Winchester disc is in use it is not essential to make backup copies of the distribution software. However, should this be considered desirable, the method is described in the section on *Disc Housekeeping*.

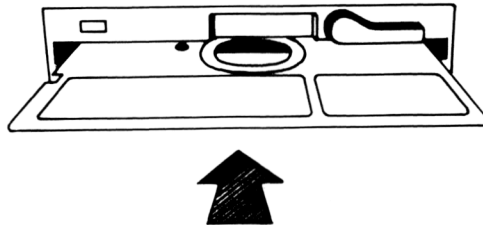
Check any Release Notice that may be supplied with your machine; this will detail any recent variations or corrections.

2.3.1 To Install Panos on the Winchester Disc (ADFS)

- Switch on. The mains power switch is located on the rear panel of the ACW, near the mains cable inlet.

After a short period (about 15 seconds), the Pandora start up message and the '*' prompt should appear (see section *Pandora*). If it does not, check the brightness control on the VDU (see the section *External Description - Main Unit*).

- Ensure that the TUBE light is *ON*. The TUBE light is on the left hand side of the keyboard. If it is not on, move the switch at the rear of the keyboard to the right.
- Place disc 1 (the Panos start up disc) into the floppy disc drive. The label on the disc should be uppermost, as in the diagram below:



Close the drive by turning the lever down.

- Now type:
 *disc
 *dir :0.\$

This instructs Pandora to use the simple floppy disc drive filing system (DFS) rather than the advanced disc system (ADFS). The second line ensures that the directory is set to the root directory.

- Now type:

```
*Panos
```

This causes Pandora to load and run the Panos operating system from the floppy disc. After a short interval, the Panos prompt ‘->’ should appear.

- Set the date and time by typing in the current values. A variety of formats are recognised, but for the moment use ‘DD-MMM-YY HH:mm’, as in the example below:

```
-> set date 25-jul-86 09:30
```

- Now type:

```
-> dfs:install
```

This causes Panos to load and execute a command file called *install-cmd* from the floppy disc. The command file creates the necessary file directories, and copies the files relating to Panos onto the Winchester disc.

If the Winchester disc already contains files (i.e., Panos is being *re-installed*), then append the *-force* qualifier to the command:

```
-> dfs:install -force
```

- When the contents of the first floppy disc have been transferred to the Winchester disc, the ‘->’ prompt will reappear. Remove disc 1 and insert disc 2 (Panos System) in the floppy disc drive. Again, type:

```
-> dfs:install
```

to copy the contents of the second disc to the Winchester.

The install command establishes directories before copying a series of files, one at a time, to the Winchester disc. After each file has been copied, a confirmation of this fact is sent to the screen on the line below, along with a notification of the size of the file transferred.

The command is set up so that on the first error encountered, the installation is abandoned. After the second Panos installation disc has been executed, an installation check is carried out, using the command file *\$.PanosTests.check*. The final message confirms that Panos was successfully installed on the ADFS.

Should a message such as:

```
Error in Copy
```

or,

```
+++ ***** not found
```

appear followed by termination of the install process, then something has gone wrong. A file may have been corrupt, or the *-force* command may have been omitted when re-installing Panos.

This procedure has installed the Panos Operating System, the Panos editor and linker, BBC BASIC for the 32000 processor, the BASIC screen editor, and the Acorn 32000 assembler.

The compilers for Pascal, FORTRAN, C or the LISP interpreter, must first be installed before they can be used. Insert the appropriate disc containing the language and type:

```
-> dfs:install
```

2.3.2 To install Panos onto an Econet File Server (NFS)

First with Disc 1, then with Disc 2, type:

```
-> install nfs
```

or,

```
-> install nfs -force
```

if Panos has already been installed.

Other software (including compilers distributed on DFS formatted discs) is installed on NFS in a similar way. Insert the disc, but type:

```
-> dfs:install nfs
```

or,

```
-> dfs:install nfs -force
```

if the software has been installed on the fileserver before.

2.4 Running the Welcome Demonstration

To run the Welcome demonstration, place Disc 7 (*Panos Welcome Package*) in the floppy disc drive, and type:

```
-> set dir dfs:  
-> welcome
```

The first command line instructs Panos to use the Disc Filing System. The second line instructs Panos to load from the floppy disc, and execute a command file called *welcome-cmd*. A menu, from which selections may be made by typing a number followed by **RETURN**, will appear on the screen

With the 'Welcome' disc in the floppy drive, the Welcome programs may be copied onto the Winchester disc by typing:

```
-> dfs:install
```

or

```
-> dfs:install ADFS
```

in the case of the ACW 443. When the contents of the start up disc have been transferred to the Winchester disc, the 'Welcome' demonstration program can be run by typing:

```
-> set dir adfs:PanosDemos
```

This selects the directory 'PanosDemos' within the ADFS filing system. This directory contains the program file 'Welcome'. To run it, type:

```
-> welcome
```

The Welcome suite contains a series of short demonstration programs, selected from a menu. They do not claim to be examples of excellence in programming technique, but they do show some of the capabilities of the ACW and Co-Processor computers.

2.5 The AD/NFS File Directories

During installation, several groups of files have been copied and stored within automatically created directories. Advanced users may configure Panos as they wish, but certain directory names and file extensions should be reserved for the use of Panos itself. If you are puzzled by any of these

matters, skip to the sections entitled *Panos Filing System Conventions* and *Configuring Panos and Local Environments* at the end of the section on the *ACW Filing Systems*.

2.6 Leaving Panos

From the command line, (that is, from the line beginning '->'), you can leave the Panos Operating System by typing:

```
-> .quit
```

Remember to park the heads of the hard disc – by typing *bye* – before switching the computer off from the two-way mains switch at the rear of the main unit.

3. The Hardware

3.1 Main Unit

Model 443 of the ACW as illustrated; its main unit contains the display screen, disc drives, processors and memory. The main unit can be tilted and swivelled gently on its stand by holding the computer at the lower front corners.

The Winchester disc drive normally supplied has a storage capacity of 20 megabytes. The floppy disc drive is designed for use with 5 1/4 " soft sectored, double sided, double density 80 track discs.

3.2 Display

Screen contrast and speaker volume control knobs are located at the front of the main unit, below the screen.

Text and graphics can be displayed in various modes. These are described in the *Display Interface* section of the *ACW I/O Processor Guide*.

Depressing the **[SHIFT]** and **[CTRL]** keys simultaneously will interrupt data being sent to the screen. This is useful if any text is scrolling up the screen too quickly for it to be examined. Alternatively, the 'paged' mode may be selected from Panos, using the *set* utility:

```
-> set vdu -paged true
```

Screen colours may be changed by using different parameters with the *vdu* command; for example:

```
-> set vdu -colour green
```

3.3 Keyboard

Special features of the keyboard are shown in figure 2 below, and described in the following sections. A detailed description of the software interface to the keyboard is given in the *Cambridge Series I/O Processor Guide*.

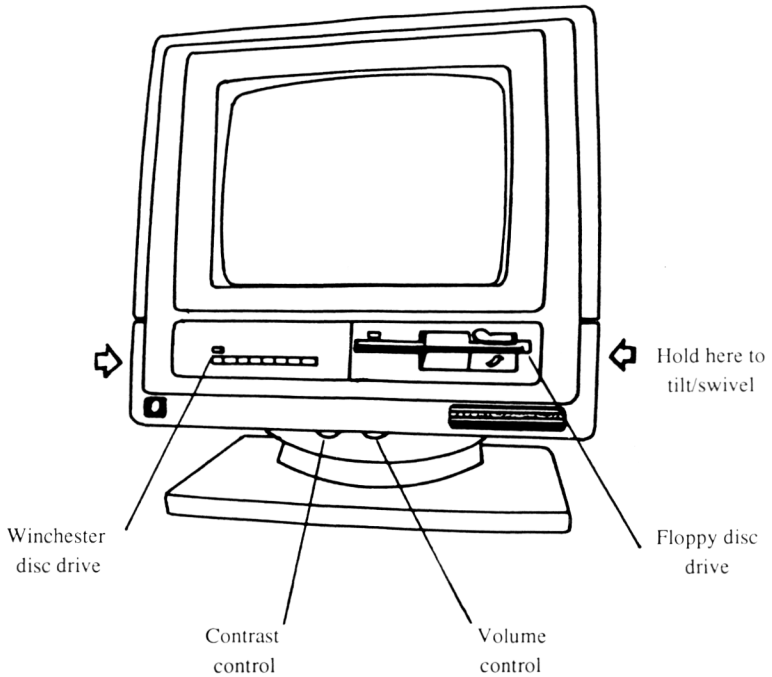


Figure 1: The Workstation

The BREAK button and the TUBE switch are mounted on the rear panel of the keyboard.

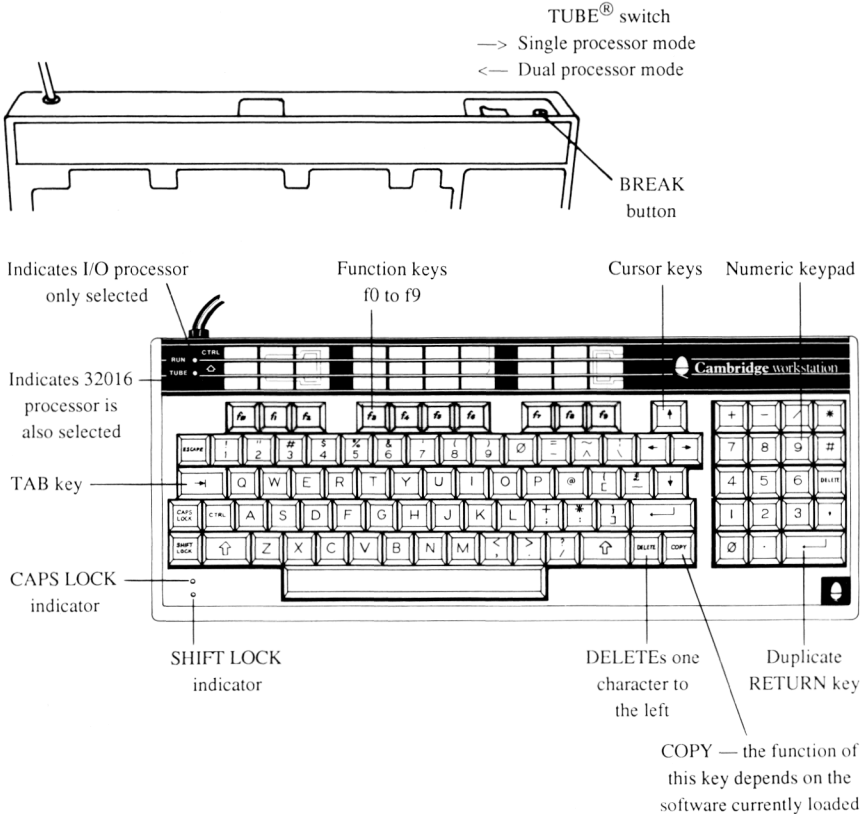


Figure 2: The Keyboard

3.3.1 Features of the Keyboard

Auto-repeat

Most of the keys automatically repeat when held down. The auto-repeat rate, and the delay before auto-repetition starts, may be set with the *configure* utility. The **ESCAPE** **CAPS LOCK** **SHIFT LOCK** **CTRL** and **SHIFT** keys do not auto-repeat.

Function Keys

The functions of these 'soft keys' (labelled **f0** – **f9**), may either be set by the user, or they may be established by a program loaded from disc. For example, they may be assigned uses on loading the Panos Editor and BASIC Editor programs. Using the **SHIFT** and **CTRL** keys in conjunction with the function keys may provide a further set of functions.

A spiral bound booklet of function key cards is supplied with the ACW. These indicate the settings of the function keys according to the software supplied. The booklet is designed so that the back page slots under the transparent strip at the rear of the keyboard.

Escape Key

Although the action depends on the software actually running, the **ESCAPE** key can often be used to free the machine from a program loop, or to take the user to a previous level.

The Break Button

This forces a return to the Pandora operating system kernel. The Break button is useful should a program get stuck in a loop that cannot be left by pressing the **ESCAPE** key.

Pressing the BREAK button alone gives a 'soft reset'; this neither clears the definitions of the user-defined keys, nor does it reset the system clock. Pressing **CTRL** and BREAK together gives a 'hard reset', which clears memory and resets the clock. This is equivalent to switching on the Workstation.

The Tabulate Key

This generates a 'tab' character when used with programs which interpret it (e.g. the editor). It causes the cursor to move to pre-set positions (tab stops)

on the screen. The stops may be established with the *set* utility.

Line Editing

The four cursor control keys allow the user to move the flashing ‘read’ cursor to any place on the screen. The **COPY** key will make a copy of the text directly above this ‘read cursor’ position to the ‘write cursor’ position. Characters copied in this way can be mixed with characters entered from the keyboard.

Note that the **COPY** and the cursor control keys are ‘soft keys’, so they may have had uses other than line editing assigned to them.

The TUBE Switch

The ACW makes use of two processors – the 8-bit ‘6502’ and the more powerful 16/32-bit ‘32016’: these communicate across the Acorn TUBE. For normal operation, the TUBE rocker switch on the back of the keyboard unit is set to dual processor mode. The TUBE indicator light comes on when the ACW is powered up, confirming that both the 32016 and 6502 processors are operating. If the TUBE switch is moved to single processor mode, only the 6502 processor will operate.

3.4 Disc Drives

The Workstation has a Winchester disc drive on the left and a floppy disc drive on the right.

The use of the disc drives is introduced in the *The ACW Filing Systems* section of this guide, and is described in more detail in the *Cambridge Series I/O Processor Guide*.

To ensure trouble-free operation of the disc drives, the ACW should not be exposed to excessive heat, moisture, direct sunlight or very dusty conditions. The ventilation slots at the front of the Winchester disc drive should be kept clear.

3.4.1 Winchester Disc Drive

The Winchester disc drive normally fitted has a nominal storage capacity of 20 megabytes.

To avoid damage or data loss, do not move the ACW whilst it is running. After using the ACW, the heads must be moved to the parking zone before switching off the mains power. The exact command to park the heads will depend on which program is in control. For instance:

From BASIC (either 32000 BASIC or 6502 BASIC) type:

```
> *bye
```

From Pandora type:

```
*bye
```

(the '*' is supplied by Pandora)

From Panos type:

```
-> .quit
```

to return to Pandora, before typing:

```
*bye
```

3.4.2 The Floppy Disc Drive

The floppy disc drive is designed for use with 5 1/4 " soft sectored, double sided, 80 track discs.

The storage capacity of a floppy disc depends on the modulation system used for recording. On the ACW, the Advanced Disc Filing System uses 'modified frequency modulation' (MFM). This is often referred to as 'double density' storage. MFM allows a capacity of 640 kilobytes for an 80 track, double sided disc.

The ACW can also use the Acorn Disc Filing System. The DFS employs standard frequency modulation (loosely referred to as 'single density' storage), resulting in a capacity of 400 kilobytes per disc. When using DFS it is also possible, to read from (but not to write to) discs using 40 track format, by using the **DRIVE* command.

Care of Floppy Discs

Floppy discs should be kept away from dust, liquids, magnetic fields and direct sunlight; they should be stored at a temperature between 0°C and 30°C.

3.5 Disc Housekeeping

3.5.1 Formatting ADFS: Discs and Making Backup Discs

Programs for formatting discs and making backup copies are contained on a utilities disk supplied with the ACW. Many of these utility programs have Panos equivalents and are therefore not strictly necessary, but you may find them useful.

The utilities perform the various housekeeping functions necessary for a disc filing system. The package includes a 'help' facility for each utility.

3.5.2 The Disc Utilities

The utilities are divided into three categories:

- ADFS Floppy utilities
- ADFS Winchester utilities
- ADFS General utilities

One of these groups may be selected from the first menu. Subsequent menus allow the selection of a particular utility and give detailed information about each one, if required. A brief description of each utility is given below.

Using the Utilities

The utilities are written in BBC BASIC and run on the 6502 I/O processor. They make use of 6502 assembler routines and will not run under 32000 BASIC. The programs may be used directly from the floppy disc, or they may be installed onto the Winchester disc.

To run the utilities from the floppy disc, select the single processor mode by moving the 'TUBE' rocker switch to the left whilst keeping the **CTRL** key depressed. Insert the utilities disc into the floppy drive and type:

```
>*DIR :4  
>*AUTILS
```

A menu will then appear on the screen. Under both Pandora and Panos, the floppy disc drive is designated ':4'; the Winchester disc drive as ':0'.

To install the utilities onto the Winchester disc, enter Panos and type:

```
-> copy :4.$...* -to :0.$...* -exact
```

Copy this exactly, i.e. including the dots. This carries out a 'tree copy' of all the files in the utilities directory on the floppy disc, transferring them to the

Winchester. To select a utility program, enter single-processor mode and type:

```
>*DIR :0.$
>*AUTILS
```

ADFS Floppy Utilities

- Aform* Formats single- or double-sided, 40- or 80-track discs to the ADFS (double density) format.
- Backup* Makes an identical copy of an ADFS floppy disc.
- Verify* Checks that there are no errors on an ADFS floppy disc.

ADFS Winchester Utilities

- Wform* Formats a Winchester disc. This operation erases the entire contents of a hard disc and is completely irreversible; there is no way that files lost by re-formatting can be retrieved – you have been warned! Because of the large capacity of the Winchester disc, formatting takes some time to carry out.

The 443 is supplied with its Winchester disc pre-formatted, so *Wform* will not need to be used for some time. Make sure that you keep up-to-date copies of all files except temporary files on floppy disc (see *Backup Copies*, below). The files can then be restored individually to the Winchester disc if they are erased in error, or after the hard disc has been re-formatted.
- Verify* Checks a Winchester disc for errors.

ADFS General Utilities

- Catall* Lists the contents of all the directories on a disc (floppy or Winchester).
- Copyfiles* Copies files from one filing system to another.
- Dircopy* Duplicates part or all of an ADFS directory structure in another part of the ADFS directory, possibly on another disc.
- Exall* Lists the contents of all the directories on a disc. (Similar to *Catall*).

- Harderror* Removes a sector of a floppy disc containing a hard error from the free-space map.
- Recover* Enables accidentally deleted files to be recovered.
- Weditor* Enables the data in any sector of the Winchester disc to be displayed and, if necessary, changed.

3.5.3 Backup Copies

It is recommended that backup copies of all permanent files be made.

The Panos *copy* utility provides a convenient means of doing this. If, for instance, a user should wish to make archive copies of all the files kept in a directory on the Winchester disc called 'usdir', the command:

```
-> copy usdir.* -to :4 -confirm
```

could be used. Here, (because of the *-confirm* qualifier,) the user is asked to accept the copying of individual files before each file is transferred to the floppy disc.

Network users should consult their network manager about arrangements for backing up their files.

3.5.4 Compacting Winchester Disc Files

During a period of typical use, a large capacity Winchester disc will provide for the creation, reorganisation and deletion of a great many disc files. In so doing, different parts of the disc are called into use and then freed. It is therefore recommended, as part of normal 'housekeeping' duties, that the user compacts the files periodically. This consolidates the files and causes free space on the disc to be gathered into larger contiguous sections. The action, which also often improves file access times and releases further free space on the disc, is carried out by using the ADFS *COMPACT* command.

To see the effect of compacting the hard disc, first use the *MAP* command. This lists the free space on the disc, in two columns: first the disc address, then the length of free space (in units of 256 byte sectors). The *MAP* command may be followed by the *FREE* command; this displays the amount of both free and used space left on the disc. For example (in Pandora):

```
*MODE 0
*MAP
*FREE
*COMPACT 30 50
```

The two numbers after the *COMPACT* command are the recommended values of the start page (16_30), and the length in pages (16_50) of the screen memory used as a work area.

Note that compacting the hard disc may take several minutes, and that during the process the disc access light will flash on and off. Do not be alarmed if the screen display is erratic, since screen memory is used as a buffer (i.e. work area). When the first pass compaction is complete, the star prompt will reappear (although it may be difficult to see if the screen display is particularly mixed up).

Type the *MAP* command again –

```
*MAP
```

– and notice that the list of free spaces on disc is now shorter, and that the first free space on the disc has been moved to a higher address. It may be worth entering the *COMPACT* command again, to further reduce the fragmentation of free space.

```
*COMPACT 30 50
*MAP
*FREE
```

The list of free spaces will probably be shorter this time, and it may even be worth repeating the compaction; but soon there will be little or no free space gained by repeated compacting.

It may prove useful to build these steps into a command sequence. This sequence could be submitted at the end of each working week, or more frequently if the hard disc is used intensively.

3.6 Processors

The Workstation uses the National Semiconductor 32000 chip set, including the NS32016 Central Processing Unit (CPU) and the NS32081 Floating Point Unit. These have a 32-bit internal architecture and use a 16-bit external data bus. The Workstation also contains a 6502-type processor (in

fact, a 6512 processor is used), which acts as an input/output processor and can also be used independently (see the *Single Processor Mode* section in this manual). In this case the Workstation acts as a BBC model B+ microcomputer with 64 Kbytes of memory.

3.7 Memory

The ACW is supplied with the Pandora operating system kernel (MOS), the NFS, ADFS and DDFS filing systems, the BBC Microcomputer BASIC 2 interpreter and the terminal emulator firmware, all in the form of ROM (Read Only Memory) packages.

A list of the operational ROMs may be obtained by typing:

```
*ROMS
```

For each of the filing systems, 'help' information – in the form of a command list with syntax – may be elicited by using the filing system name, as in the following examples:

```
*HELP
*HELP DFS
*HELP NFS
*HELP ADFS
```

Four megabytes of Dynamic Random Access Memory is also fitted.

3.8 Interface and Communications Ports

The various interface and communication ports supplied with the ACW can be seen on the rear panel of the main unit. The ports are clearly labelled, in accordance with figure 3.

The pinouts of these connectors are given in an Appendix to the *Cambridge Series I/O Processor Guide*.

3.9 The System Architecture

Figure 4 shows the main units of the ACW and how they are connected. All peripheral devices are handled by the 6502 I/O (Input/Output) processor, which communicates with the main 32016 processor via the TUBE.

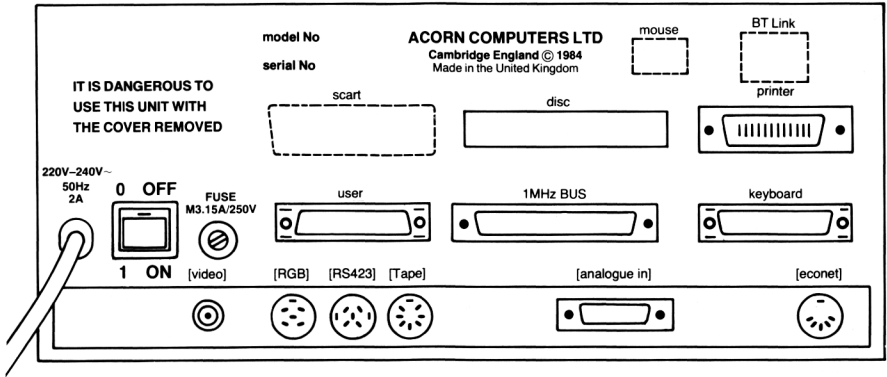


Figure 3: ACW Rear Panel Connections

ACW System Architecture

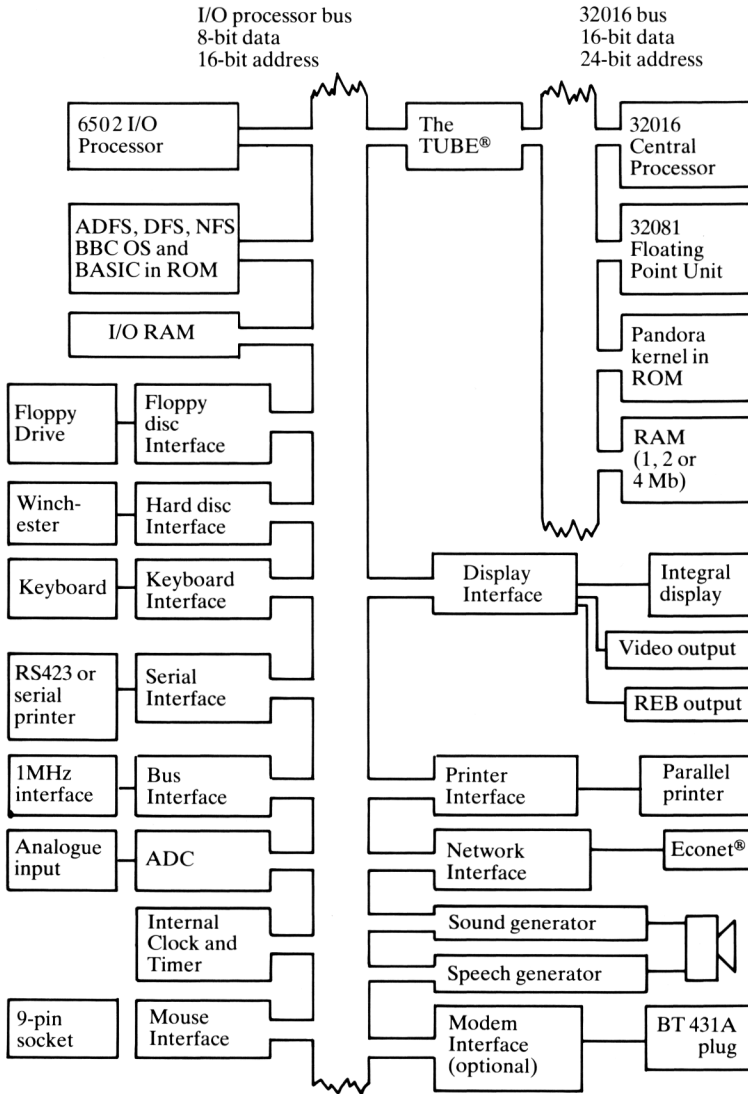


Figure 4: Main Units of the ACW

4. The Operating System

The main ACW operating system is known as Panos: it is loaded from a resident operating system kernel called Pandora. 32000 BASIC and some assembler output may be run directly from Pandora, as is Panos itself. Executable code, program compilers and utilities are run under Panos. This relationship is sketched in figure 5.

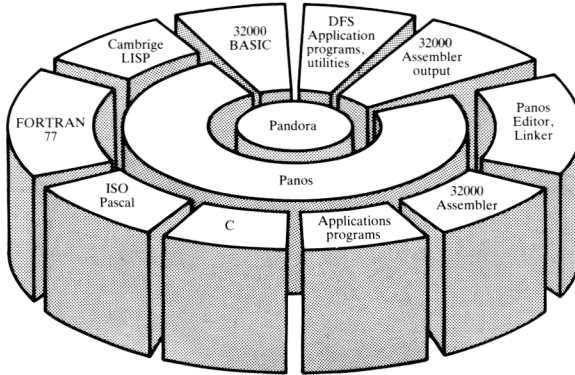


Figure 5: Simplified ACW operating system relationships

4.1 Pandora

The operating system kernel, Pandora, is a ROM resident program, operated by the 32016 processor. It performs several tasks, including communication with the I/O processor. Pandora issues a star (*) prompt.

The * commands described in the *BBC Microcomputer User Guide* may be given to Pandora directly, without typing the *. They will be handed to the I/O processor for direct execution.

The following programs run directly under Pandora:

- Panos
- 32000 BASIC (Bas32)
- 32000 Assembler output (if requested)

4.2 Panos

Panos is the main operating system of the ACW. It provides many facilities for writing, loading, and running programs. Panos also provides flexible ways of creating command files, so that a range of activities (such as compiling, linking, and running batches of programs) can be carried out automatically.

Installing Panos

The procedure has been described in the section *Installing the Software*. If a new version of Panos is to be installed over an existing system, the keyword *-force* must be appended to the install command line:

```
-> dfs:install -force
```

or, to install over the network onto a file server:

```
-> dfs:install nfs -force
```

This allows the old files to be written over. Existing user files will not be destroyed or altered by this procedure. During such a re-installation, and when the *install* command file attempts to create directories which already exist, “errors” will be reported; these particular error messages should be ignored.

4.2.1 Running Panos

Stand-alone Workstations

To enter Panos from Pandora, type:

```
*PANOS
```

To leave Panos and re-enter Pandora, type:

```
-> .quit
```

Note that the command contains a dot before the word *quit*. (*.Quit* is one of several Panos ‘dot commands’.)

Network Stations

Panos is loaded by the following commands:


```
*NET  
*I AM <identifier> <password>  
*PANOS
```

substituting your own identifier and password (if set). Further information is given in the *Cambridge Series I/O Processor Guide*.

There is, in addition, a Panos utility called *logon*, which allows the user to log on to the file server. Details are provided in the *Panos Guide to Operations* manual.

To leave Panos and re-enter Pandora, type:

```
-> .quit
```

Panos Overview

The sections that follow give a brief introduction to Panos. A more detailed description is given in the *Panos Guide to Operations* manual.

4.3 Panos Commands

A command to the Panos operating system may be entered at the keyboard in upper or lower case, or in any mixture of the two. The first word on the line is the command word, the remaining words are its parameters.

If the command word does not begin with a full stop, then Panos will load and execute a file identified by the command word. The file may be one of the following:

- a command file which contains a list of further commands
 - a system utility: these are concerned mainly with operations on files and are listed below
 - other system programs, including the editor, linker and language compilers
- or,
- an executable program or command file written by a user.

Command words beginning with a full stop ('dot commands') are executed immediately. These are generally concerned with lower-level operations than are the Panos utilities. Two examples of dot commands which the new user

may find useful are:

- `.quit` - leaves Panos and enters Pandora
- `.pwd` - prints the current working directory

Further dot commands are described in the Panos Guide to Operations.

4.4 Panos Utilities

The utilities and keywords are described in more detail in the *Panos Guide to Operations*, but some commonly used utilities are listed below, in order to give an idea of some of the Panos functions.

4.4.1 Keywords

Among the parameters of a utility may be one or more keywords. These are prefixed by a hyphen ('-'), and serve to modify the action of the utility, or to identify other parameters.

A useful keyword which may be used with any utility is *-help*. This causes the named utility to display a description of what it does, along with a list of the keywords which may be used with it. When the *-help* keyword is added to a command, the command is not executed.

- Access* Changes the access permissions of the files.
- Catalogue* (abbreviation *cat*) displays information about files.
- Configure* This is an interactive program which allows the user to change certain system parameters, such as the screen mode, printer port assignment and keyboard auto-repeat rate.
- Copy* This copies files and directories, and can be used to send data to devices. For example:

```
-> copy -from file1 -to file2
```

```
-> copy file1 -to vdu:
```

(The second example will display the contents of *file1* on the screen. Depress **SHIFT** and **CTRL** to halt the scrolling text.)

<i>Create</i>	Creates files or directories.										
<i>Delete</i>	Deletes files or directories.										
<i>Echo</i>	'Echos' its argument line to the screen, which is useful for providing user feedback in command files.										
<i>Logon</i>	Admits users to a network file server.										
<i>Rename</i>	Renames files or directories.										
<i>Set</i>	Sets certain Panos parameters. For example: <table style="margin-left: 40px;"> <tr> <td>date</td> <td></td> </tr> <tr> <td>time</td> <td></td> </tr> <tr> <td>tabs</td> <td>sets the stops for the tabulate key</td> </tr> <tr> <td>vdu</td> <td>sets the screen mode, text colour, etc.</td> </tr> <tr> <td>dir</td> <td>sets the directory path.</td> </tr> </table>	date		time		tabs	sets the stops for the tabulate key	vdu	sets the screen mode, text colour, etc.	dir	sets the directory path.
date											
time											
tabs	sets the stops for the tabulate key										
vdu	sets the screen mode, text colour, etc.										
dir	sets the directory path.										
<i>Show</i>	Displays the values of the Panos parameters as for <i>set</i> .										
<i>Star</i>	Simulates BBC Microcomputer * commands.										
<i>Edit</i>	Creates and edits text files (see edit section)										
<i>Link</i>	Links Acorn Object Format (- <i>aof</i>) files to produce a Relocatable Image Format (- <i>rif</i>) File (see <i>The linker</i> section).										

4.5 Panos Editor

The Panos editor permits the creation and editing of text files. It can be used to prepare source code for the language compilers and the assembler. More detail is given in chapter 7 of the *Panos Guide to Operations*.

The editor makes extensive use of the function keys; a removable keyboard card is provided to indicate these functions. The edit program itself contains a good deal of helpful information; this is displayed by typing `(SHIFT) - (ESCAPE)` within the edit program.

To use the editor to create a new document, type:

```
-> edit
```

To edit a file which already exists, type *edit*, followed by the filename of the document. For example:

```
-> edit progname-pas
```

For large files, it may be necessary to increase the buffer space allocation above that of the default, for example:

```
-> edit bigfile -buffer 500000
```

Note that the editor does not automatically save the edited document, but must be told to do so by depressing **(F5)**. The user will be prompted for the name under which the document is to be filed. To leave the editor type **(SHIFT)-(F3)**, and reply to the question with 'Y'.

4.6 The ACW Filing Systems

The following filing systems may be used on the ACW:

ADFS: The Advanced Disc Filing System. This uses the Winchester disc and floppy discs with MFM ("double density") format.

DFS: This uses floppy discs with FM ("single density") format, so as to maintain compatibility with earlier systems.

NFS: The Network Filing System enables a number of stations to share a filing system that is operated by one of them (the file server) and uses the Econet network.

A brief description of the systems is given below. More details may be found in the *Cambridge Series I/O Processor Guide* and in the *Panos Guide to Operations*.

4.6.1 Structure of ADFS: and NFS:

These are tree-structured filing systems. The root directory of the filing system contains the names of files and of sub-directories. Each sub-directory may contain further files and sub-directories. The full name of a file consists of the name of the filing system in which it is stored, followed by the names of the sub-directories along the route from the tree-root to the file, then by the file name itself. The component items are separated by full stops. This structure is referred to as the 'pathname'.

Figure 6 shows an example directory in a filing system.

ADFS: (including the colon) is the name of the filing system; '\$' is the root directory; 'LIB' and 'TESTS' are sub-directories; 'prog', 'bas32', 'panos' and 'clock' are files.

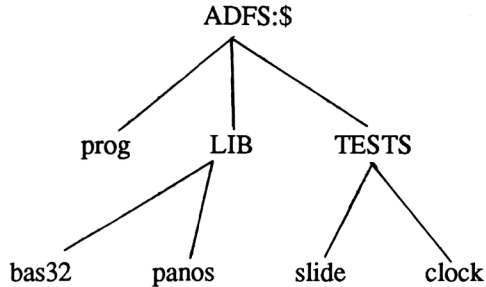


Figure 6: Example Directory

Note that the use of upper or lower case or a mixture of cases is insignificant in file and directory names. The full name of the file 'clock' is therefore:

```
adfs:$.tests.clock
```

The dollar symbol ('\$') indicates the root directory. Ampersand ('&') may also be used, but is mainly used to achieve uniformity with the Econet filing system, which makes a distinction between a root directory and a user's log-on directory.

In order to avoid having to give the full name of a file, a current working directory is assumed, and is automatically prefixed to any file names. On power up, this directory is set to 'ADFS::0.\$'.

To change the current working directory within Panos, the *set* utility is used. For example:

```
-> set dir tests
```

will change the current working directory from the existing directory (say, ADFS:\$), to the directory 'tests' with the current directory (say, ADFS:\$.tests).

4.6.2 ADFS: Implementation Details

In ADFS: the different drives are referred to by numbers preceded by a colon, as follows:

- :0 The Winchester disc.
- :4 The first floppy disc drive.

Other numbers are reserved for future expansion. The directories and files on each drive form a self contained tree. The unit number appears in the path name immediately after the filing system name. The default option is :0, which need not appear in the path name. If the files and directories in the example above had been on drive :4, the full path name would be:

```
ADFS::4.tests.clock
```

4.6.3 NFS: Implementation Details

In NFS, each user is allocated a password-protected directory within the filing system, known as the *log-on directory*. The user may refer to this by the shorthand symbol '&'. The *root directory* of the NFS filing system is referred to by '\$'.

4.6.4 DFS: Details

In DFS:, the surfaces of the discs are referred to individually as follows:

1st drive:	upper surface	:0
(as on ACW)	lower surface	:2

The DFS uses a single-level directory structure; there are no sub-directories. The directory name is a single character. Under DFS, the full name of a file has the following form:

```
DFS::2.a.progname
```

DFS:	is the filing system name
:2	is the surface number
a	is the directory character
progname	is the filename

The full stops are delimiters.

The default surface number is 0, and the default directory character is \$.

4.6.5 File Name Extensions

The names of the files themselves should all have a suffix indicating what type of file it is. For example, '-txt' is the standard extension name for files containing printable characters. There are a number of reserved suffixes: a definitive list of these can be obtained by printing out the current !Panos file (see the *Panos Guide to Operations* manual).

4.6.6 Device Handling

Devices such as the screen, keyboard and printer are treated in the same way as the filing systems within Panos. For an example, the *copy* utility can be used to transfer the contents of one file to another, to display those contents on the screen, or to send them to a printer. Device names end with a colon. Some useful device names are:

KB: The Keyboard

VDU: The Screen

PRINTER: or LP: The Printer

(More details are given in the *Panos Guide to Operations*)

4.6.7 Using the Advanced Disc Filing System with Panos

On models equipped with a Winchester disc, almost all filing operations will use the Winchester disc exclusively. The floppy disc drive is used for importing and exporting software, and for making backup copies of software created on the Winchester. Acorn software is currently supplied on DFS 'single density' (FM) discs, but for all other purposes ADFS 'double density' (MFM) format is recommended. This is because of the greater capacity it affords, plus the fact that it shares the tree-structured directories of the Winchester disc, making it simpler to copy files by using the Panos *copy* utility. New floppy discs must be formatted before use, and a utility is provided for this purpose; it is described in the earlier *Disc Housekeeping* section of this guide.

4.6.8 Panos Filing System Conventions

Each directory is created during the installation procedure so as to contain particular groups of files. It is advisable to conform to this structure, since Panos, as it is supplied with the ACW, recognises certain directory names and searches for files within these. Advanced users are free to configure Panos as they wish, but Acorn software and documentation assumes this structure to be present. This is an outline of the main directories' functions; more details about Panos file extensions and directories can be found in the *Panos Guide to Operations*.

Library

The Library contains programs which are executable under Pandora by simply typing their name, for example, *Bas32* and *Panos*.

PanosLib

PanosLib contains files (usually system programs) which should be accessible to Panos from wherever the user happens to be in the filing system. For instance, if the user is in directory *\$.pascal.allprogs*, the user should still be able to use the editor, the various compiler libraries, and all the other utilities and command files. In other words, in the system as supplied, these programs are placed in the PanosLib directory, and it is this that Panos searches first for commands.

User

The name 'user' is generic: it stands for a class of directory which can be given any legal name by the user. This type of directory could be the working directory where the user will be after entering Panos, and where most time will be spent. It contains the language files created by the user.

'User' is divided into sub-directories according to the languages or applications being used. For example, the user could have a directory for the C language, called, 'CProgs', containing further sub-directories. (Details about languages and their directories are given in the *languages* section of this guide.)

PanosDemos and PanosTests

The PanosDemos directory is created during the installation procedure so as to contain the 'Welcome' programs when the welcome disc is installed. Similarly, PanosTests is created for the 'Hello World' programs. These

programs function as short confidence tests for each language, to ensure that the installation took place correctly.

4.6.9 Configuring Panos and Local Environments

One feature of Panos is its ability to create distinct local environments. Each language or application has a different set of compilers and libraries, and a configuration suitable for use with each filing system.

When Panos is entered, system parameters (for example, file extensions) are set, according to the contents of the two files !Panos and !Config. Panos looks for these files in the current directory first.

On the ADFS/NFS, separate 'User' directories can be created, each having their own associated !Config and !Panos files. Therefore, when Panos is started up from a user directory, initialisation data is taken from the local versions of !Panos and !Config.

!Panos is altered by simply editing the file itself, and a utility called *Configure* allows alterations to be made to !Config. These are further explained in the *Panos Guide to Operations*. The !Panos and !Config files are supplied with sensible default values, and should not need changing immediately. One exception to this is if the printer one wishes to use with the ACW has a serial interface. (As supplied, the system is configured for a parallel printer.)

Note that when a new !Config file is created *configure* saves the current version of '!Config' in a file named '!Oldcon'. This helps the user who has made a mistake during reconfiguration. The previous version may be rescued by renaming the file, i.e.:

```
-> rename !Oldcon as !Config
```

followed by restarting the ACW, or the original version of !Config may be copied from the distribution floppy disc.

4.7 Single Processor Mode

The ACW may be used as a BBC B+ Microcomputer with 64K of RAM.

In this instance, the 32016 processor and its associated memory are de-selected, leaving only the 6502 processor selected. This is achieved by moving the two-way TUBE switch (located on the rear panel of the

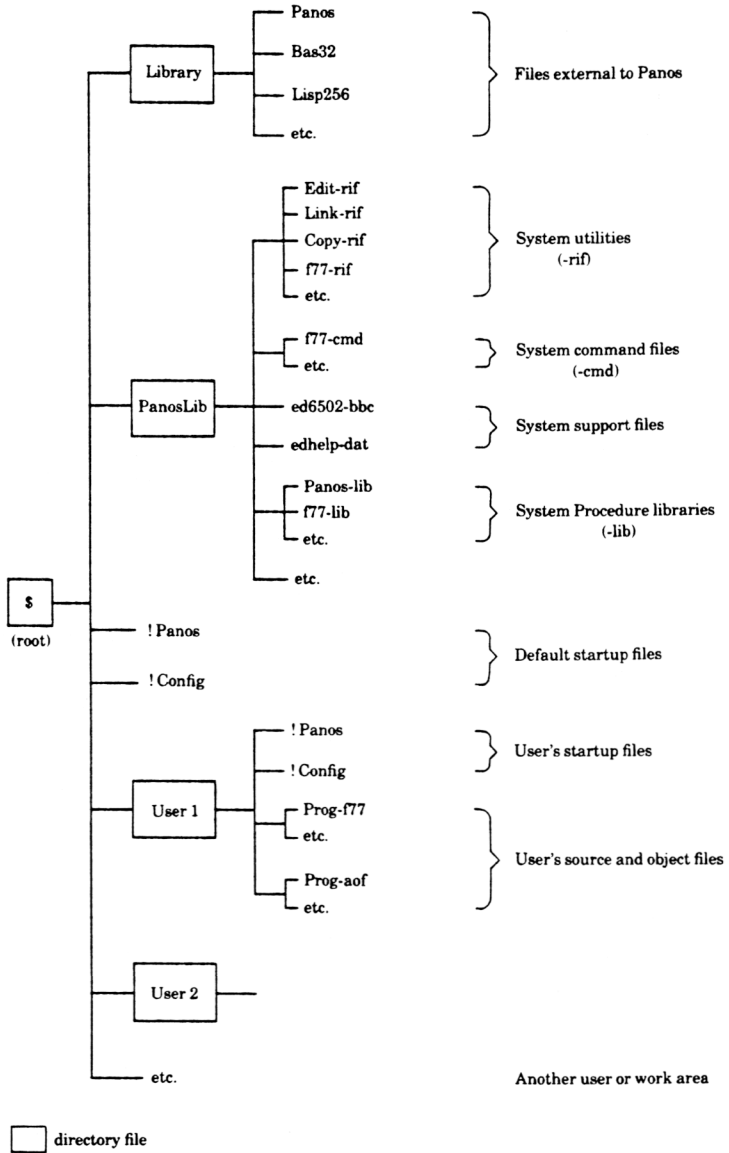


Figure 7: ADFS or NFS Directory Structure for Panos

keyboard unit) to the left, while the **CTRL** key is depressed. Ensure that all files are closed before altering the switch setting, since a cold-start entry to the relevant operating system is made when the switch is toggled. (This is equivalent to switching the ACW first off, then on again.)

All the Cambridge Workstation filing systems are available in the single processor mode. Files are interchangeable between single processor and Panos or Pandora modes, for example, between 6502 BASIC and 32000 BASIC. Refer to the *Cambridge Series I/O Processor Guide* for further information. The *BBC Microcomputer System User Guide* and associated documentation give details of operation and the BBC BASIC language, but bear in mind the minor discrepancies due to differences in the keyboard and other hardware features.

The 6502 BASIC interpreter resides in part of the ACW's Read Only Memory (ROM). In single processor mode, the area of memory available is limited to 64 kilobytes.

6502 machine code programs may be run in single processor mode. Many may also be run under Pandora or Panos, for example:

	Type	to produce
Single Processor Mode	*cat	*cat
Pandora	cat	*cat
Panos	star cat	-> star cat

5. Languages

With the exception of the interpreted language 32000 BASIC, all of the languages available for the ACW are used under the Panos operating system.

Installing the languages which run under Panos

Installing a language means copying files from the distribution disc to the correct locations on a particular filing system. This process is carried out automatically by a command file called 'install-cmd', included on the distribution disc. The procedure has been described in *Getting started with a new system*. If a new version of a language is to be installed, and this supersedes an older version which has been installed previously, the keyword -force must be appended to the install command line.

```
-> dfs:install -force
```

This allows the old files to be written over.

Note that the Assembler and 32000 Basic are automatically installed from distribution disc 1, during the Panos installation procedure.

5.1 32000 BASIC

5.1.1 Introduction

This is an extended version of BBC BASIC, implemented on the high performance 32016 processor. The language will be familiar to users of the BBC Microcomputer, though programs written in 32000 BASIC will of course run faster and will have access to a much greater memory space. Furthermore, a screen editor is provided.

A comprehensive description of the BASIC language may be found in the *BBC Microcomputer System User Guide*. The new and revised features of 32000 BASIC are included in the *32000 BBC BASIC* reference manual which accompanies the language disc. In fact, BASIC version IV for the 32000 is the same as that supplied with the Acorn Master 128.

5.1.2 Installing 32000 BASIC

During the installation procedure for Panos (see section *Panos*), the BASIC Interpreter and screen editor is copied from distribution disc 1 into the directory '\$.Library'.

5.1.3 Using BBC BASIC

Note that 32000 BASIC is only accessible from Pandora, and not from Panos, by typing BAS32, thus:

```
*BAS32
```

Do NOT type *BASIC*, as you might be tempted to do if you are familiar with the BBC Microcomputer! The language will announce itself with a message in the form:

```
BBC BASIC IV for 32000 (c) Acorn 1985
```

This is followed by the usual BBC BASIC prompt:

```
>
```

If the prompt does not appear, it could be that BASIC is not being called from the correct filing system (e.g., BASIC has been installed on the NFS, and the workstation is not logged on to the Econet).

To leave BASIC and return to the Pandora prompt, type *QUIT*.

Loading and running programs is carried out in the same way as with previous versions of BBC BASIC. The *LOAD* command may be used to load programs into memory from disc which have been *SAVED* under earlier (6502) implementations of BBC BASIC. Similarly, programs entered using the 32000 BBC BASIC may be saved and then loaded into other implementations of the language (bearing in mind that 32000 BASIC programs may exceed the memory range of 6502 BASIC).

If you have an existing BBC BASIC program available that you would like to use (in this example it is called "file_name") then enter the following:

```
>LOAD "file_name"  
>RUN
```

remembering to include the quotes. Alternatively, use the command:

```
>CHAIN "file_name"
```

(*CHAIN* performs the action of both *LOAD* and *RUN*.)

A small sample of 32000 BBC BASIC is provided by the program on disc 1 of the distribution discs called 'bWorld'. During installation onto the AD/NFS, this is copied into the directory '\$.Panos Tests'. Bworld is a simple confidence test which prints out the message 'Hello Basic world':

```
*bas32
BBC Basic IV for 32000 (c) Acorn 1985
>
>LOAD "bWorld"
>
>LIST
10REM 32000 BBC BASIC - basic confidence test
20PRINT "Hello Basic world"
30END
>
>RUN
Hello Basic world
```

5.2 Cambridge LISP

5.2.1 Introduction

The Cambridge LISP interpreter runs under Panos and, like 32000 BASIC, it is an interactive language which contains its own programming environment for creating, editing and saving programs.

For a full language description, refer to the *Cambridge LISP Reference Manual*, supplied with the language disc.

5.2.2 Installation

To install LISP, follow the instructions given for 'Installing languages which run under Panos', given at the beginning of this section on *Languages*.

5.2.3 Using LISP

Having entered Panos, type:

```
-> VLISP
```

This command loads LISP in the “standard” fashion i.e. the image files are looked for in the directory ‘\$.PanosLib.LispImage’, and identification is given after LISP has loaded.

5.2.4 Customising

No message is given after loading, unless the *-identify* start-up option has been used. The store image is loaded from the directory image. As more complex use is made of LISP, the various store preservation functions can be used to produce customised versions. See the *Cambridge LISP Reference Manual* for more details. For example, if the REDUCE system is available, typing:

```
-> LISP -image Reduce
```

will run REDUCE (if the image files for the reduce system reside in a directory called ‘reduce’).

The process of customisation takes the form:

```
-> LISP -image OldImage -dump NewImage
```

This preserves modules in the directory NewImage using the store image in OldImage as a base.

5.2.5 An example session

The following example shows the dialogue during a short session with Cambridge LISP. ‘1World’ is a small demonstration program provided with the language disc. During installation onto the AD/NFS, it is copied into the directory ‘\$.PanosTests’. The program simply prints the message ‘Hello LISP World’. First, LISP is entered, the program is loaded, listed, and, finally executed.

Chapter 5

-> VLISP

```
Acorn Cambridge LISP entered in about 440 Kbytes
Store image was made at 11:38:27      on 10 May 86
LISP version - 1.00 23 Apr 85 image size = 125244 bytes
```

```
Started at 10:43:11 on 15 Jul 86 after 0.01+8.85 secs -
49.2% store used
```

```
(rdf 'lworld)
lworld
```

```
*** End of file detected
```

```
***End of RDF
```

```
nil
```

```
lworld
(lambda nil (printc "Hello LISP world"))
```

```
(lworld)
Hello LISP world
"Hello LISP world"
```

5.3 Compiled or Assembled Languages

5.3.1 Introduction

This section describes the use of the following languages which are available for the ACW.

```
FORTRAN 77
ISO Pascal
C
Acorn 32000 Assembler
```

The procedure common to all of these languages is described first, followed by a separate section which includes an example for each language.

User-written source code for these languages is usually created using the Panos editor, saving the source code in a file. This file is then processed by the appropriate compiler or assembler to produce an object file in Acorn Object Format (-aof). This object file is then linked with system or library routines, if required, using the linker. The product of the linker is a relocatable file in Relocatable Image Format (-rif). Such a file may be loaded and executed by typing in its name from Panos. The process of program creation is outlined in figure 8 below:

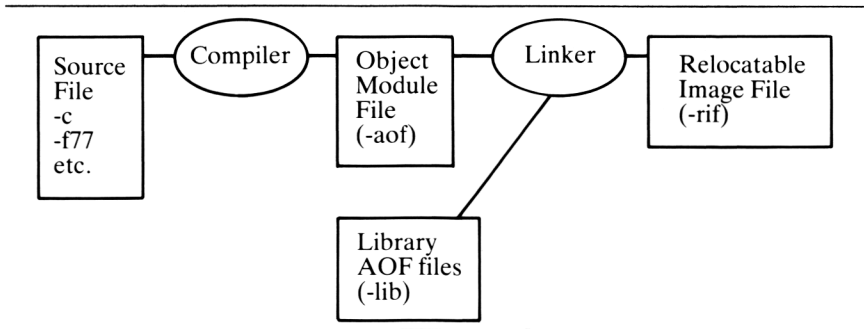


Figure 8: Program Creation

The source file must be given a name with a file name extension appropriate to its language:

-f77	for FORTRAN
-pas	for Pascal
-c	for C
-asm	for ASSEMBLER

5.3.2 The Compilers

The source file may be compiled by typing the compiler name followed by the source file name. The compiler names are:

f77	The FORTRAN 77 compiler
pascal	The ISO Pascal compiler
cc	The C compiler
asm32	The Acorn 32000 Assembler.

The file name extension of the source file may be omitted, since the compiler will automatically seek a file name with the appropriate suffix.

For example, in order to compile a Pascal file which has been created using the Panos editor, and has been saved under the name 'laplace-pas', type:

```
-> pascal laplace
```

The compiler will generate an object file with the name 'laplace-aof'.

5.3.3 The Linker

The linker is a program that builds an executable file from compiled or assembled programs.

For example, to link a file compiled with the FORTRAN77 compiler, type:

```
-> link fourier f77
```

The linker looks for a file with the appropriate extension, in this case the file name is 'fourier-aof'. The parameter 'f77' refers to a file called F77-LIB, which contains the standard input/output library and other machine-specific functions that a FORTRAN77 program may need.

The linker generates a relocatable file, 'fourier-rif'. To run this program, type:

```
-> fourier
```

Panos will look for a file of this name and having the 'rif' file name extension: it will then load the program and execute it.

The library files which must be given to the linker are:

for Pascal	the file 'pas' (pas-lib)
for FORTRAN77	the file 'f77' (f77-lib)
for C	the file 'c' (c-lib).

This set of operations may be automated by using a command file to compile, link, load and execute a source file. See the *Panos Guide to Operations*.

With regard to compiling and linking, various options are possible; refer to the individual language manuals for details. The linker itself is described in the *Panos Guide to Operations*.

5.4 32000 ISO Pascal

5.4.1 Introduction

The 32000 ISO Pascal compiler runs under the Panos operating system. Details regarding compatibility with other versions of Pascal (in particular Acornsoft ISO Pascal), use of the compiler, and implementation extensions and restrictions, are given in the *ISO Pascal Reference Manual*.

5.4.2 An Example Session

'pWorld-pas' is a small demonstration program provided on the Pascal distribution disc. During installation onto the AD/NFS, it is copied into the directory '\$.PanosTests'. The program is a simple confidence test which prints the message "Hello Pascal World". The program is listed (copied to vdu), compiled, linked, then executed.

```
-> copy pWorld-pas -to vdu:
```

```
PROGRAM World (Output);
```

```
(* Acorn 32000 ISO Pascal - basic confidence test *)
```

```
BEGIN
```

```
WriteLn ('Hello Pascal world')
```

```
END.
```

```
Pworld-pas copied to vdu:Pworld-pas (122 bytes)
```

```
-> Pascal pWorld
```

```
7 lines compiled
```

```
-> Link pWorld Pas
```

```
-> pWorld
```

```
Hello Pascal world
```

The command *Pascal* compiles the program 'pWorld-pas' (note that the extension does not need to be given), and the command *Link* links the file pWorld-aof with the Panos and Pascal libraries. See the *Panos Guide to Operations* for further details of linker commands, and of how they can be automated. To run the program, simply type its name.

5.5 32000 FORTRAN 77

5.5.1 Introduction

The 32000 FORTRAN 77 compiler runs under the Panos operating system. Details of this implementation of the language, of how to use the compiler, etc. are given in the *FORTTRAN77 Reference Manual*.

5.5.2 An Example Session

'fWorld77' is a small demonstration program provided on the FORTRAN77 distribution disc. During installation onto the AD/NFS, it has been copied into the directory '\$.Panos Tests'. It is a simple confidence test which prints

the message “Hello Fortran World”. The program is listed (i.e., copied to the vdu device), compiled, linked, then executed.

```
-> copy fWorld-f77 -to vdu:
```

```
PROGRAM World
C   Acorn 32000 Fortran 77 - basic confidence test
PRINT *, 'Hello Fortran world'
END
```

```
fworld-f77 copied to vdu:fworld-f77 (120 bytes)
```

```
-> F77 fWorld
```

```
Program      WORLD Compiled
```

```
Total workspace used 5054
```

```
Main program (WORLD): code 64; data 28
```

```
Total code size: 64; data size: 28
```

```
-> link fWorld F77
```

```
-> fworld
```

```
Hello Fortran world
```

```
STOP
```

```
->
```

The command *F77* compiles the program ‘fWorld-f77’ (note that the extension need not be given), and the command *Link* links the file fWorld-aof with the Fortran and Panos libraries. See the *Panos Guide to Operations* for further details of linker commands, and of how they can be automated. To run the program, simply type its name.

5.6 32000 C

5.6.1 Introduction

The C compiler runs under the Panos operating system. Details regarding the implementation of the language, the use of the compiler, etc. are given in the *C Reference Manual*.

5.6.2 Header Files

During the installation procedure, a number of header files are copied into the directory 'Panoslib'; their use is described in the *C Reference Manual*.

5.6.3 An Example Session

'cWorld-c' is a small demonstration program supplied on the C distribution disk. During installation onto the ADFS or NFS, the program is copied into the directory '\$.PanosTests'. It is a simple confidence test which prints the message 'Hello C World'. The program is listed (copied to the vdu), compiled, linked, then executed.

```
-> Copy cWorld-c -to vdu:
/* 32000 C - basic confidence test */

main()
{
printf("Hello C world\n");
}
cWorld-c copied to vdu:cWorld-c (78 bytes)

-> cc cWorld
Product:CC_NS32016, Version:cc version 1.4

-> Link cWorld c
-> cWorld

Hello C world
```

5.7 Acorn 32000 Assembler

Acorn's 32000 assembler runs under the Panos operating system. The *32000 Assembler Reference Manual*, supplied with the ACW system, gives details of the required source code format and the assembler directives. A full language description of the assembler can be found in the *National Semiconductor 32000 Series Instruction Set Reference Manual*, available separately.

5.7.1 Installing the 32000 Assembler

During the installation procedure for Panos (described earlier), the Assembler is copied from distribution disc 1 into the directory 'panoslib'.

5.7.2 An Example Session

Below is a simple demonstration using 'aWorld-asm', a program present on distribution disc 1. During installation onto the AD/NFS, the program is copied into the directory '\$.PanosTests'. In this example, the program is listed (copied to vdu), assembled, linked, then run.

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-> copy aworld-asm -to vdu:

```
MODULE World
; 32000 Assembler - basic confidence test
IMPORTC XBlockWrite = 'IO' . 'XBlockWrite'
ENTRY
ADDR msg, TOS
ADDR @msg_len, TOS
CXP XBlockWrite
MOVQD 0, R0
RXP 8
NLSYM 10 ; ASCII standard: Newline = 10
msg DCS 'Hello Assembler world*N'
msg_len EQU $-msg
END
```

aworld-asm copied to vdu:aworld-asm (286 bytes)

-> asm32 aworld

Relocatable code: 34 bytes.
3 passes required.

-> link aworld

-> aworld

Hello Assembler world

Guide To Documentation

Release Notice:

This provides the most up-to-date information on the software, including enhancements, installation details, bug fixes etc.

Panos Guide to Operations:

This gives a comprehensive description of the Panos operating system, both for the user and for the high-level language programmer.

Cambridge Series I/O Processor Guide:

Describes filing systems, display, keyboard and peripheral interfaces of the 6502 Input/Output processor for the Acorn Cambridge Workstation and the Cambridge Co-Processor.

Panos Programmers Reference Manual:

Of interest to users who wish to write programs which interface with Panos at a low level.

Language Manuals

32000 Assembler Reference Manual

32000 BBC BASIC Reference Manual

FORTRAN 77 Reference Manual

ISO Pascal Reference Manual

C Reference Manual

Cambridge LISP Reference Manual

The language manuals describe the implementation dependent features of the languages, the compilation control parameters, and diagnostic facilities. The guides are not intended to serve as reference manuals to the standard features of the languages.

BBC Microcomputer Related Documentation

The guide to the Cambridge series I/O processor does not claim to be exhaustive, it is simply a collection of material which is thought to be relevant and useful to 'typical' ACW users. Expert or specialist users may need access to particular manuals written for the BBC Microcomputer.

Chapter 5

BBC Microcomputer System User Guide

Part Number 0433 000

Issue 1, October 1984

Disc Filing System User Guide

Part Number 0403 700

Issue 2, 1983

Winchester Disc Filing System User Guide

Part Number 0427 000

Issue 1, 1984

Econet Level 2 File Server User Guide

Part Number 0412 018

Issue 1, 1983

Econet Level 2 File Server Manager's Guide

Part Number 0412 017

Issue 1, 1983

There is a set of manuals specifically written for the BBC Microcomputer Master Series. This includes:

Master Series Welcome Guide

Part Number 0443,000

Issue 1, 1986

Master Series Reference Manual Part One

Part Number 0443,001

Issue 1, 1986

Master Series Reference Manual Part Two

Part Number 0443,002

Issue 1, 1986

In addition, the following items of 'third party' documentation may prove useful:

6512A Microprocessor Handbook
7002 (ADC) Data Sheet
6522 (VIA) Data Sheet
6845 Video Controller Data Sheet
6850 (ACIA) Data Sheet

The Advanced User Guide for the BBC Micro
Bray, Dickens and Holmes.
Cambridge Microcomputer Centre, 1983.

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Winchester Disc 1,4,5

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