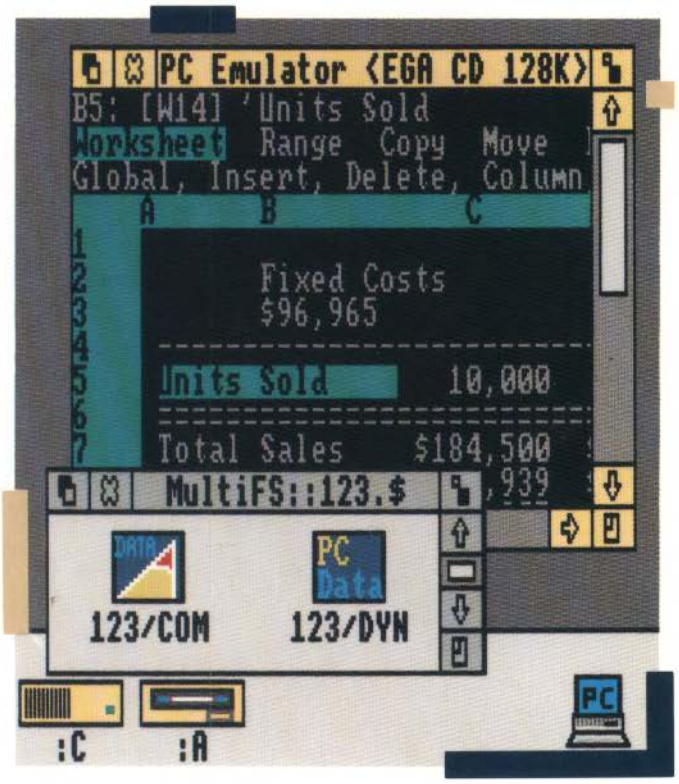
# PC EMULATOR




Acorn

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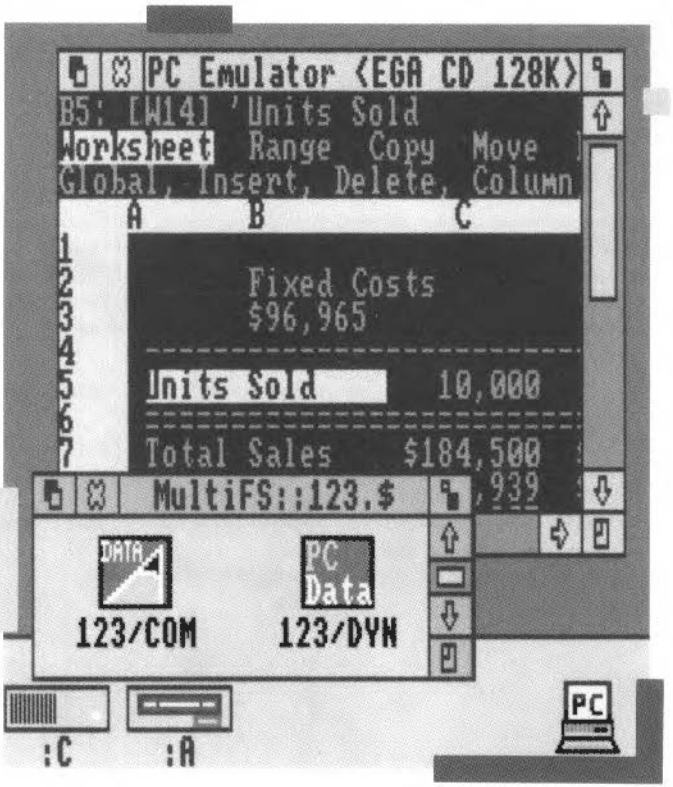


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# Contents

# About this Guide

## Introduction

The PC Emulator allows standard DOS applications to be run on a RISC OS computer. It does this by emulating the hardware of an IBM PC compatible computer and then running a standard copy of DOS on this emulated hardware.

This Guide is not a DOS tutorial. It only describes how to install and run the PC Emulator and explains those DOS utilities that are specific to the PC Emulator. There are many good books available for DOS, and some suggested titles appear at the end of this Guide.

## The PC Emulator package

The PC Emulator package contains three discs:

- the large PC emulator disc (called MDA/CGA/EGA Multitasking)
- the small PC emulator disc (called CGA Single tasking)
- the MS-DOS 3.30 disc.

The large PC Emulator disc (*MDA/CGA/EGA Multitasking*) contains all the files needed for the PC Emulator **!PCEm**. These are:

- !PCEm – the PC emulator application
- !MultiFS – the desktop filer application that lets you view DOS format discs in a window
- !System – which contains modules needed by the emulator
- !Fonts – which contains fonts used when emulating a monochrome display adaptor
- !Merge – an application that should be used to update your existing !System and !Fonts.

The small PC Emulator disc (*CGA Single tasking*) contains all the files needed for the PC Emulator, **!PCEmS**. These are:

- !PCEmS – the small PC emulator application
- !MultiFS – the desktop filer application that lets you view DOS format discs in a window
- !System – which contains modules needed by the emulator
- !Merge – an application that should be used to update your existing !System and !Fonts.

The MS-DOS 3.30 disc contains MS-DOS, standard DOS utilities and other DOS utilities that are specifically for use with the PC Emulator. The disc is in DOS format and can only be read with the emulator (or MultiFS).

### Memory requirements

If your computer has 2MB or more of RAM memory, then use the large emulator **PCEm**.

If your computer has 1MB of RAM memory, then use the small emulator **PCEmS**.

The emulator does not operate in a computer with less than 1MB of memory.

You should choose which of these versions you are going to use. The instructions in this guide refer to both PCEm and PCEmS, and the differences between them are described.

### The PC Emulator PCEm

PCEm is a RISC OS application that runs in a window on the RISC OS desktop simultaneously with other RISC OS applications. It also has a 'Single Task' mode of operation in which the emulator takes over the whole screen. In 'Single Task' mode, the emulator runs faster and the computer appears to be an IBM PC clone running DOS. PCEm will run its normal modes in 2MB of memory. However the EGA+ mode requires more than 2MB.

### The PC Emulator PCEmS

PCEmS is a reduced version of the emulator for use with computers that have only 1MB of memory. PCEmS only operates in full screen (Single Task) mode; it does not operate in a window. Additionally, it only emulates the Colour Graphics Adaptor (CGA) display.

### Viewing MS-DOS files

Also supplied is MultiFS, an application that lets you view your DOS format discs in a RISC OS window. MultiFS allows files to be moved, copied and deleted using normal desktop operations.

## Upgrading your current PC Emulator

If you are running one of the earlier versions of the PC emulator first turn to page 29 to find out how to upgrade to this version.

## Upgrading your current version of DOS

If you are using an earlier version of DOS and want to upgrade it, first follow the instructions on page 29.

# Installing the PC Emulator

Before you start this chapter you must decide which version of the emulator you are going to use. PCEm needs at least 2MB of memory, while PCEmS can operate with 1MB.

If you are using PC Emulator on a floppy disc based computer there is no installation to be done.

You should make backups of the master floppy discs. See the *RISC OS User Guide* for instructions on backing up the RISC OS discs. The DOS disc should be backed up using the DOS command DISKCOPY. For more information on using the DISKCOPY command see the chapter entitled *A brief introduction to DOS* on page 21.

For details of how to configure and run the PC Emulator, turn to the chapter entitled *Configuring the PC Emulator* on page 5.

The emulator can only save files on floppy discs that have previously been DOS formatted. To DOS format a disc, use the DOS FORMAT command; see your DOS documentation for instructions; RISC OS formatted discs will not work.

## Installing the emulator on a hard disc

This section explains how to install the PC Emulator on a computer with a hard disc.

### Copying the emulator applications onto hard disc

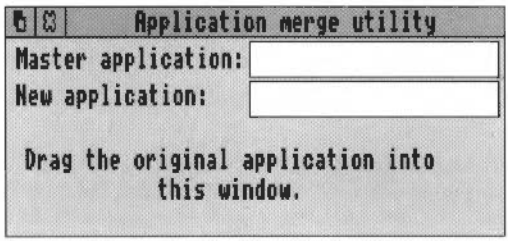
Copy the emulator files to a suitable directory on your hard disc. We recommend that you use the directory `$.PC`.

1 Put the emulator floppy disc in the disc drive and click on the floppy disc icon to display the contents.

2 Make a new subdirectory on your hard disc (use the **New directory** option on the Filer menu) and copy into it the applications MultiFS and PCEm (or PCEmS) from the emulator disc you have chosen.

### Update your System and Fonts directories

The emulator floppy disc also contains updates for your existing System and Fonts directories. The application **Merge** updates your System and Fonts directories automatically. Start Merge by double-clicking on it, a dialogue box like this is displayed:




1 Drag your existing System application to anywhere in the Merge dialogue box. The upper box (for the master application) changes to show its path name.

2 Now drag the System application from the emulator disc onto the Merge dialogue box. The pathname for this will appear in the lower box.

If there are no problems, your original System will be updated and the message 'Application updated' will appear.

3 Repeat the process for Fonts.

If you don't have an existing Fonts directory, just copy the directory into the root directory of your hard disc.

If there are problems, you should read the error message and take the appropriate action. The only common error message you may see is 'disc full', which is unlikely to occur if you are merging onto a hard disc.

When you have finished, quit the application by clicking on the Close icon.

4 Remove the emulator floppy disc from the disc drive.

## Creating a DOS formatted hard disc

The emulator does not have its own hard disc, instead it uses a special RISC OS file as a simulated hard disc. In this section, when we refer to the PC hard disc, we are really referring to this file. However, in DOS terms, this file looks and behaves like a proper DOS hard disc drive.

There are four stages in creating a PC hard disc:

1 Create a RISC OS file that the emulator can use as a PC hard disc.

2 Partition the simulated PC hard disc and create a bootable DOS partition on it.

3 Format the simulated disc.

4 Copy the DOS utilities onto the hard disc.

If you already have a PC hard disc file created with a previous version of the emulator it can still be used, see the appendix entitled *Appendix B: Upgrading* on page 29.

If you want to create a second PC hard disc drive file, turn to the section entitled *Creating a hard disc drive* on page 9.

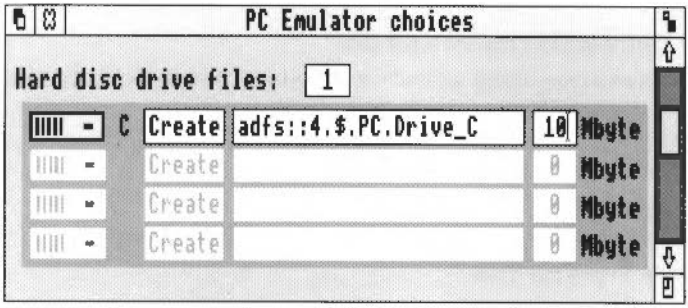
### Create the RISC OS file that the emulator uses as a PC hard disc

1 Load the PCEm (or PCEmS) application and choose the **Configuration** option from the icon bar menu.

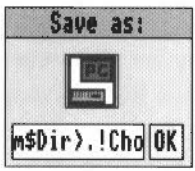

2 Click Select over the number next to **Hard disc drive files**; this changes the number to 1. (Clicking Adjust to decreases the number). The default file name `adfs::4.$.PC.Drive_C` is displayed. This creates a file named Drive_C in the PC directory. If you have stored your emulator files in a different directory or wish to create a differently named file erase this and type in a suitable RISC OS name.

3 Type in the size (in Megabytes) for the PC partition.

4 Create the hard disc partition by clicking on the word **Create**. This creates an unformatted PC hard disc partition.




5 Save the configuration by scrolling to the bottom of the dialogue box and then clicking on **OK** in the **Save as** box.



### Partition the hard disc

1 Put the DOS system disc in the disc drive.

2 Click on the emulator icon on the icon bar.

This boots DOS from the floppy disc. If a floppy disc is not present DOS tries to boot from the hard disc, which will result in a error message. If this happens, quit the emulator application and load it again.

3 At the DOS prompt type **FDISK** and press Return. This will run the DOS utility that partitions hard discs.

4 Choose option 1, Create DOS Partition, and follow the program (by pressing the Return key) to create a bootable Primary DOS partition that occupies the whole hard disc space. At the end, FDISK will ask you to press any key in order to reboot DOS.

### DOS format the disc

At the DOS prompt, type **FORMAT C: /S** and press Return. This will format drive C, which is usually the first DOS hard disc.

If there are more than two floppy discs configured then the first hard disc will not be C: and care must be taken to give the correct drive letter to the format command. For example, if there are four floppy discs, the floppy discs are named A:, B:, C: and D: in sequence and the first hard disc will be E:, so the command to format the first hard disc would be:

```
FORMAT E: /S
```

### Copy the DOS utilities onto the hard disc

At the DOS prompt, type: **COPY A:*.* C:** and press Return. This will copy all the files on the floppy disc into the root directory on the hard disc.

It is possible to place the DOS utilities elsewhere on the hard disc but if this is done then the CONFIG.SYS and AUTOEXEC.BAT files must be moved into the root directory and the AUTOEXEC.BAT file updated to tell DOS where to look for the DOS utilities.

For example, to move the utilities in a directory called DOS in the C drive:

1 Change to drive C by typing

```
C:
```

2 Create the directory DOS by typing

```
MKDIR \DOS
```

3 Move the files to \DOS by typing

```
COPY A:\*.* C:\DOS
```

4 Add the line **PATH C:\DOS** to the AUTOEXEC.BAT file by typing

```
ECHO PATH = C:\; C:\DOS >> C:\AUTOEXEC.BAT
```

If you want the DOS prompt to show the name of the current subdirectory. Type in the following:

```
ECHO PROMPT$P$G >> C:\AUTOEXEC.BAT
```

# Configuring the PC Emulator

You should now have installed the emulator.

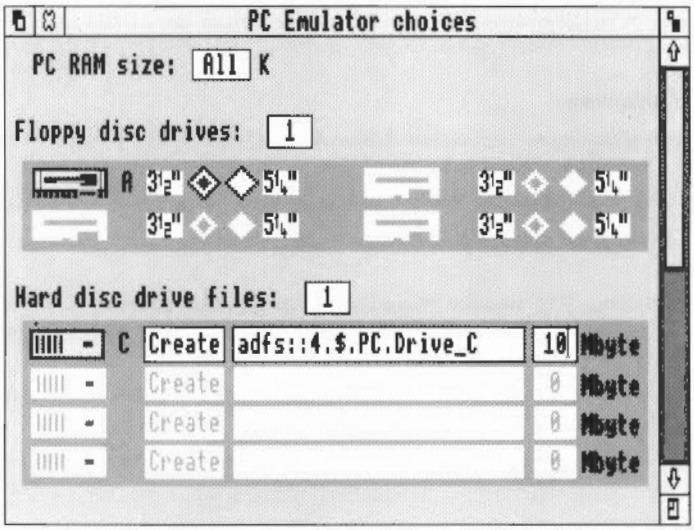
If your computer has a hard disc you should have created a partitioned and formatted hard disc file for DOS. Finally you should have copied the contents of the DOS floppy disc onto the hard disc file.

This chapter explains how to configure the emulator to suit your requirements.

## The configuration dialogue box

The configuration dialogue box is displayed by choosing the **Configuration** option in the icon bar menu. This option allows you to change details about the actual PC that is emulated. The configuration menu can only be accessed when the emulator is loaded but not running. Changing the configuration whilst the emulator is running is like trying to remove a graphics card from a PC while it is switched on!

If you change any of the options, the changes do not take effect until you have saved them by clicking on **OK** in the **Save as** box. The configuration options are saved, in plain text, in a file called **!Choices** in the emulator application directory. The **PC Emulator choices** window is scrollable as the bottom part of the window is hidden. Click under the vertical scroll bar to see the hidden part of the window.



### PC RAM size

This option specifies the amount of RAM that the emulated PC can use, up to a maximum of 640KB. The default setting is **All**, which means that the PC Emulator will emulate a PC with as much memory as possible, up to 640KB.

If there is insufficient memory available when the PC Emulator is loaded, a warning message is displayed and the emulator icon is removed from the icon bar.

### Erase RISC OS? *(PCEmS version only)*

Clicking on this option maximises the memory available to DOS by deleting unwanted RISC OS modules from memory when the PC Emulator is started.

When you use the PC emulator you can usually leave the PC environment and return to the RISC OS desktop by clicking the middle mouse button. You can then go back to the PC environment by clicking on the emulator icon. The **Erase RISC OS** option removes this function.

The list of modules that are deleted from memory by this option can be found in the file `!PCEmS.GenBoot.!Modules`. Do not change this file unless you know what you are doing.

### Floppy disc drives

Click Select on the number (next to the title) to add disc drives (click Adjust to remove them). If you have a 5 1/4" drive attached make sure you click on the appropriate 5 1/4" button.

You should not configure more floppy drives than there are real physical floppy disc drives. If you want your PC hard disc drive to be called C:, reduce the number of configured floppy drives to one or two.

### Hard disc drive files

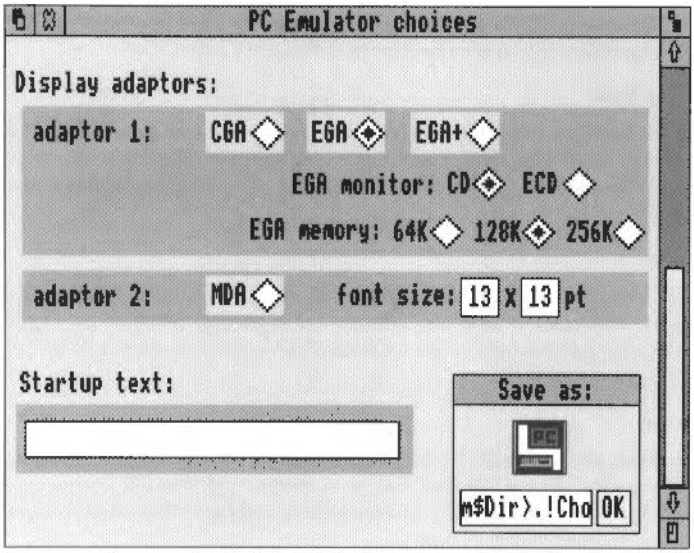
Click Select on the number (next to the title) to add hard disc drives (click Adjust to remove them).

There can be up to four hard disc drive files, however MS-DOS 3.30 will only support two.

If you try to specify a hard disc file that does not exist, a warning is displayed when you start the emulator.

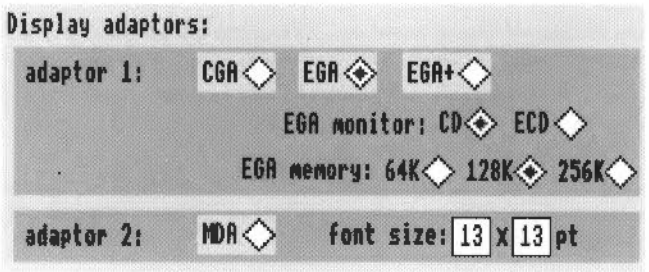
If a file representing a PC hard disc exists, but the emulator has not been configured for it, rather than type the filename into the dialogue box you can drag the file itself into the disc drive filename field in the dialogue box.

To set up a new hard disc drive see the section entitled *Creating a hard disc drive* on page 9.




### Display adaptors *(PCEm version only)*

Although there are several different types of display adaptors available, most users should simply choose **EGA**. If you have a multi-frequency or VGA-compatible monitor you can choose EGA monitor **ECD**, in all other cases choose **CD**. You should also choose the least amount of EGA memory needed to run your program; most run with 128K. However some applications need 256K to run properly.




#### Display adaptors in detail

It is possible to use two display adaptors:

- Adaptor 1 can be either a CGA, EGA or EGA+ display.
- Adaptor 2 is an MDA display.

Normally only one adaptor will be configured. Click Select on the adaptor names to select the adaptor required. To disable an adaptor click Adjust on the highlighted option.

The chosen display should be the simplest that is suitable, as this will use the least RISC OS memory. MDA uses the least memory, followed by CGA, EGA and EGA+. Only CGA is available when running PCEmS. A number of programs that run under VGA will run successfully under EGA+ (for example, Microsoft Windows 3.0).

### EGA Monitor types

With the EGA display you can specify the monitor type it is connected to. The choice is either CD (Colour Display) or ECD (Enhanced Colour Display). CD should be chosen if you have a medium-resolution monitor. If you have a multi-frequency or VGA-compatible monitor you can choose ECD.

### EGA memory

With the EGA display you can specify the amount of memory to be used in the emulation of the adaptor. You should specify the least amount of memory that will allow the PC program to run. Increasing the memory used by the graphics adaptor will increase the RISC OS memory needed to run the emulator.

### MDA font size

This option allows you to change the default font size that the MDA display uses. The default size is 13x13 points. If you change this to a smaller size the PC screen size will be correspondingly smaller too. You can also change font size in the MDA window menu; see the section entitled *Running PCEm* on page 11.

## Startup text

This option allows you to define an action for the computer to perform after it has booted up correctly. The startup text can be any valid DOS command.

For example, to display the directory you would type in **DIR|M**. Always use `|M` to end a command (instead of pressing Return).

## Saving the configuration

Once you have decided which options to use, click on the **Save as** OK box. This saves your configuration in a file called **!Choices** in the PCEm applications directory.

Although !Choices is the standard file in which to save your configuration, you can save the configuration in any file. Type a new filename into the Save as box and then drag the icon to a directory. The file has a special PC icon.

To use this configuration file, make sure that RISC OS has 'seen' the PC emulator application, then double click on the configuration file icon. This starts the emulator with the parameters stored in the configuration file.

## Creating a hard disc drive

To create an additional hard disc increase the number of hard disc drive files by one. Enter the correct path name, and the desired size of the new hard disc drive file.

Click on the adjacent **Create** button. There will be a delay whilst the drive is created.

Save the new configuration by clicking on the **Save as** OK button.

Start the PC Emulator. If you are creating the first hard disc you will need to insert a bootable DOS floppy disc in the disc drive. If you already have a bootable hard disc this is not necessary as you will be able to boot from it.

Type in FDISK at the DOS prompt and follow the appropriate section below:

### Creating the first hard disc drive

Make a primary DOS partition that uses all the available space. Do this by pressing return to accept the default values until you are asked to insert a DOS diskette in drive A. Press any key to reboot DOS.

Format the new drive and make it bootable by entering:

```
FORMAT C: /S
```

Note: If you have three floppy drives the new drive will be D:, not C:. If you have four floppy drives the new drive will be E:.

### Creating the second hard disc drive

**Warning:** Read this section carefully before creating the drive to avoid the risk of formatting your existing drive.

If you are creating a second hard disc, type FDISK and at the first 'Enter choice' prompt type in '5' followed by 'Return'. This will select the next fixed disc drive. Then make a primary DOS partition that uses all the available space. Do this by pressing Return to accept the default values until you are asked to insert a DOS diskette in drive A, however this is only necessary if your first hard disc drive is not bootable. Press any key to reboot DOS.

Format the new drive by entering:

```
FORMAT D:
```

Note: If you have three floppy drives the new drive will be E:, not D:. If you have four floppy drives the new drive will be F:.

You may wish to make the drive bootable, in which case type in:

```
FORMAT D: /S
```

# Running the PC Emulator

## Running PCEm

To run the PC Emulator:

1 Double click on the PCEm icon in the directory display. This loads the emulator onto the icon bar.

2 Click on the PCEm icon on the icon bar. This displays the PC screen in a window.

3 If you do not have a PC hard disc you should insert the DOS system disc and press any key. When the PC has finished starting up (booting) you will see an A> prompt, representing the floppy disc drive.

If you have a correctly set-up PC hard disc it will boot DOS automatically as long as the floppy disc drive is empty. When the PC has finished booting you will see a C> prompt, representing the hard disc drive. If you have more than two floppy drives your hard disc will not have the C> prompt, see page 6 for more details.

### The window menu options

Display the emulator menu options by clicking Menu over the PC emulator window. The emulator window menu is only available if you are using PCEm. Menu options are not available in **Single task** mode.

#### Save Screen

This option allows you to save a screenful of data to a RISC OS file.

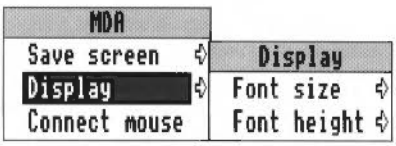
The MDA display saves the screen as a text (Edit) file. The CGA, EGA and EGA+ displays save the screen as a sprite (Paint) file. Sprite files cannot be converted to text files.

#### Connect mouse

This option allows the PC window to use the mouse. You may also have to run AMOUSE.COM, see the section entitled *The mouse driver* on page 19 for details. When the mouse is 'connected' it will drive the PC mouse pointer. Click Menu to reconnect the mouse to the RISC OS mouse pointer.

#### Display *(MDA display only)*

This defines the display font size. A bigger font size will result in a bigger PC screen. The default font size can also be set from the Configuration dialogue box.



## Running PCEmS

To run the reduced memory version of the PC Emulator:

1 Double click on the PCEmS icon in the directory display. This loads the emulator onto the icon bar.

2 Click on the PCEmS icon on the icon bar. This displays the PC screen.

This will cause all RISC OS tasks to be suspended and the emulator to run in single task mode. You can return to RISC OS, without losing your PC data, by clicking the middle mouse button (if the configuration option **Erase RISC OS** has not been chosen). Click on the emulator icon to redisplay the PC screen.

3 If you do not have a PC hard disc you should insert the DOS system disc and press any key. When the PC has finished booting you will see an A> prompt, which represents the floppy disc drive.

If you have a correctly set-up PC hard disc it will boot DOS automatically as long as the floppy disc drive is empty. When the PC has finished booting you will see a C> prompt, representing the hard disc drive. If you have more than two floppy drives your hard disc will not have the C> prompt, see page 6 for more details.

## PC Emulator icon bar menu options

The following options appear on the PC emulator icon bar menu. Click Menu over the emulator icon to display them. If you are using the reduced version of the emulator, the Freeze and Single task options are not available to you.


### Info

This gives the version number of the PC Emulator application.

### Single task *(PCEm version only)*

Clicking on this option causes the PC Emulator to use the whole screen, instead of operating in a RISC OS window. To return to window mode, click Menu.

No other RISC OS tasks run while the PC Emulator is in Single task mode. However, the RISC OS desktop will be restored as it was when you return to windowed mode. The RISC OS tasks that were running will now start again.

When running in Single task mode, the emulator will run slightly faster. Screen updates in particular will be faster and mouse movement smoother.

### Freeze *(PCEm version only)*

Clicking on this option causes the emulation to freeze. This option can be used to pause the PC Emulator while doing work in other RISC OS windows. Click on this option again to restart the emulator.

The emulator will automatically freeze when the emulator window is closed (by clicking on the close icon). Unfreeze and open the emulator window by clicking on the emulator icon.

### Configuration

Clicking on this option displays a dialogue box that allows the details of the emulated PC to be specified. This dialogue box is described in detail in the section entitled *The configuration dialogue box* on page 5.

A suitable configuration must be set up before DOS is run. You cannot reconfigure the emulator while it is running. You must first quit the emulator by choosing **Quit** from the icon bar menu and then reloading it. The Configuration option is now available on the icon bar menu.

### Quit

Clicking on this option causes the emulator to quit.

**Warning:** Any PC applications which are running will be immediately stopped and any associated data will be lost. Therefore this option should normally only be used when the PC Emulator is at the DOS prompt.

# Accessing DOS directories using MultiFS

## Introduction

MultiFS gives you DOS disc icons on your icon bar. These display the contents of PC format floppy discs and emulated hard discs in standard RISC OS desktop directory displays.

You can also perform all the standard functions (such as move, copy and delete) in exactly the same way as you would with RISC OS.

MultiFS can be used to transfer files between DOS and RISC OS floppy formats. You can copy RISC OS files onto DOS discs and DOS files onto RISC OS discs. RISC OS files stored on DOS discs can be loaded and run as normal.

## Configuring MultiFS

If you have a hard disc with a DOS partition and you have **not** named your PC hard disc partition **Drive_C** (and **Drive_D** if your have a second partition) within ADFS::4.$.PC, then you will need to alter the !Run file within MultiFS.

To edit the !Run file:

1 Hold down the Shift key while double clicking over the MultiFS application. This displays the files contained inside the application.

2 Start the standard RISC OS application Edit.

3 Drag the !Run file onto the Edit icon on the icon bar.

4 Find the following lines:

```
*If "<PCe$Drive_C>" = "" THEN *Set PCe$Drive_C ADFS::4.$.PC.Drive_C
*If "<PCe$Drive_D>" = "" THEN *Set PCe$Drive_D ADFS::4.$.PC.Drive_D
```

5 Edit the text ADFS::4.$.PC.Drive_C to the correct path name for the file you have configured for DOS drive C.

6 If you are emulating a second DOS drive then the text ADFS::4.$.PC.Drive_D will also have to be modified.

The drive specified by <PCe$Drive_D> will not be accessed if the drive specified by <PCe$Drive_C> does not exist.

The !Run file also contains a series of DOSMAP commands which map RISC OS file types to DOS extension types.

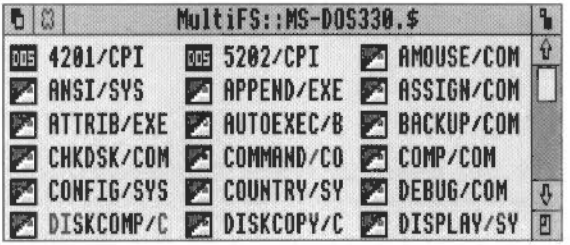
The PCe$Drive_C and PCe$Drive_D variables can also be set elsewhere, rather than by altering the !Run file.

## Starting MultiFS

To start MultiFS, double click on the MultiFS icon. The DOS disc drive icons appear on the icon bar. You only see the hard drive icon if you have configured a DOS hard disc drive file.

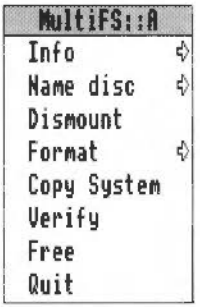
## Viewing the DOS filing system

Click on the disc icons to open the directory window for that disc.




The menu options available for DOS files and directories are exactly the same as those for RISC OS files and directories. Files can be copied and moved between RISC OS and DOS directories in the normal way. However, you can not start a DOS application by double clicking on its icon.

## Icon bar menu options




From the MultiFS icon bar menu you can select:

### Info

This give you version information about MultiFS.

### Name disc

This option allows you to give a disc any name up to 10 characters long. Disc names cannot be created which contain spaces (even though some versions of DOS allow this). MultiFS will ignore any text after the first space it finds. A name must be at least two characters long.

### Dismount

This option closes all opened directories.

### Format

This option lets you format floppy discs in the following DOS formats:

- MS-DOS 720K
- MS-DOS 720K System
- MS-DOS 360K
- MS-DOS 360K System

The System options let you put the DOS system files onto a disc so making it 'bootable'. A bootable disc can be used instead of the MS-DOS system disc to start-up the emulator. The System options can only be used if the **Copy System** option has already been used.

#### Disc naming

DOS discs formatted using MultiFS have a default volume label of the form 'HHMMYYMODD' where:

HH = 00 .. 23 (hours)
MM = 00 .. 59 (minutes)
YY = 00 .. 99 (year in current century)
MO = 01 .. 12 (month)
DD = 01 .. 31 (day)

This provides a unique disc identity for every formatted floppy disc that is similar to that used by the RISC OS filer.

### Copy System

This is necessary to allow you to use MultiFS to make a bootable DOS floppy disc.

Place a bootable DOS floppy disc in the drive. A bootable floppy disc can be made by formatting it under the emulator. See page 21 for more details.

When you choose **Copy system**, MultiFS copies every file on the floppy disc, including the boot block and the hidden system files, into the MultiFS application.

To make a bootable DOS disc choose **MS-DOS 720K system** or **MS-DOS 360K system** from the **Format** submenu. This will cause the disc to be formatted and the files (from the previous Copy system), including the boot block and the hidden system files, to be copied onto the floppy. This disc will therefore be bootable.

It is probably appropriate to use Copy system with a disc which contains only system files, perhaps together with COMMAND.COM, AUTOEXEC.BAT, and CONFIG.SYS.

Note: The system files are copyrighted, and it is therefore illegal to distribute them.

### Verify

This option will verify whether or not a floppy disc contains media faults.

### Free

This displays the amount of unused disc space on the disc.

### Quit

This removes the MultiFS application from the icon bar and from memory.

## Translating file names and attributes between DOS and RISC OS

RISC OS file names are limited to 10 characters without an extension whilst DOS names are limited to 8 characters with a 3 letter extension. The DOS interpretation of special characters is also different. File names are therefore mapped as follows:

When copying from RISC OS to DOS, names are truncated to 8 characters. For example PCEMULATOR becomes PCEMULAT. The RISC OS filetype of an object is preserved.

When copying from DOS to RISC OS the filename, including the extension is truncated to 10 characters. One of the characters will be a "/" which is added to separate the filename from the extension. For example, AUTOEXEC.BAT becomes AUTOEXEC/B.

Since there is not a complete mapping between RISC OS file attributes and those provided by DOS, attributes are set as follows:

- A RISC OS file which is write protected will be read only under DOS.
- A DOS file which is read only will be write protected and locked under RISC OS.

## MultiFS command line interface

The following commands are available from the command line:

| | |
|---|---|
| DeskTop_MultiFSFiler | Starts the MultiFS RISC OS Desktop filer |
| MultiFS | Selects MultiFS as the current filing system |
| DOSMap | Sets the MS-DOS .ext to RISC OS filetype mapping |
| Format | Format a DOS disc (*) |
| Free | Displays free and used byte counts (*) |
| NameDisc | Set the DOS volume directory entry (*) |
| NameDisk | Set the DOS volume directory entry |
| Dismount | Forget this disc (close all Filer windows) (*) |
| Verify | Verify a formatted DOS disc (*) |
| Map | Provide FAT information about the floppy |

Entries marked (*) also appear on the Filer menu.

## Running MultiFS and PC Emulator together

Two applications attempting to write to the hard disc at the same time may cause corruption. Therefore it is not generally possible to access the hard disc from MultiFS while the emulator is running.

If the hard disc partition is locked (read only), then both the emulator and MultiFS will be able to read the partition, but not write to it.

# Acorn DOS utilities

## The mouse driver

AMOUSE.COM is a Microsoft compatible mouse device driver and is supplied as one of the DOS utilities on the DOS system disc.

Load the mouse driver by typing AMOUSE at the DOS prompt. This should be done before starting a program that requires a mouse with a Microsoft compatible mouse driver. Alternatively, add the line AMOUSE.COM to the AUTOEXEC.BAT file. This will load the mouse driver every time you boot the emulator.

If you are working with the emulator in a window and running a program which uses the mouse, you should connect the mouse by using the **Connect mouse** option on the emulator window menu.

Some DOS programs (such as Microsoft Windows 3.0) use the mouse hardware directly and not via the mouse driver. These programs still work correctly as the hardware of a Microsoft bus mouse is also emulated. Therefore AMOUSE.COM need not be run.

## Transferring files between DOS and RISC OS

The GETFILE and PUTFILE utilities, also supplied on the DOS system disc, are used to transfer files between the DOS and RISC OS filing systems. They are used from within the PC Emulator at the DOS prompt. Normally it is easier to use the MultiFS application for file transfers but these utilities may be useful in DOS batch files and are included for compatibility with previous versions of the PC Emulator.

The utility GETFILE allows the transfer of files from RISC OS to DOS and has the following syntax:

```
GETFILE <RISC OS source filename> <DOS destination filename>
```

For example:

```
GETFILE ADFS::FD.$.LETTERS.BANK A:\LETTERS\BANK.DOC
```

The utility PUTFILE allows the transfer of files from MS-DOS to RISC OS and has the following syntax:

```
PUTFILE <DOS source filename> <RISC OS destination filename>
```

For example:

```
PUTFILE A:\SHEETS\ACCOUNTS.SHT ADFS::FD.$.SHEETS.ACCOUNTS
```

### Using GETFILE and PUTFILE on single floppy drive systems

To transfer files between a RISC OS disc and DOS disc with only a single floppy drive, either a RISC OS RAM disc or a DOS RAM disc must be used. If you have sufficient RISC OS memory then use a RISC OS RAM disc as the procedure is much easier. If you are short of RISC OS memory but have sufficient DOS memory then use a DOS RAM disc.

**Using a DOS RAM disc to transfer files.**

1 Start up the PC Emulator and DOS.

2 Make sure that the DOS boot disc is unprotected.

3 From the A> prompt type:

```
ECHO DEVICE=RAMDRIVE.SYS >> \CONFIG.SYS
```

4 Re-boot the PC Emulator by holding down the Ctrl and Alt keys and pressing and releasing the Delete key.

5 The screen will clear and you will get a message saying that a RAM disc has been created on drive C.

With the RAM disc created you can now start to copy files between ADFS and DOS. First copy the GETFILE or PUTFILE programs into the RAM disc using:

```
A>C:
C>COPY A:PUTFILE.EXE C:
C>COPY A;GETFILE.EXE C:
```

If you are transferring files from ADFS, you can now put the ADFS disc into the drive and type, for example:

```
C>GETFILE ADFS::FD.$.MYFILE MYFILE.DOC
```

If you are putting files onto an ADFS disc, first copy the files from your DOS disc into the RAM disc and then use PUTFILE to transfer them to the ADFS disc.

**Using a RISC OS RAM disc to transfer files**

1 Create a RAM disc as described in your RISC OS User Guide.

2 If you are **transferring a file from ADFS to DOS** put the ADFS disc into the drive, and copy the file from the floppy disc into the RAM filing system (click on the RAM filing system icon on the icon bar to open up a directory viewer for it).

3 Start up the PC Emulator and DOS.

4 Insert the DOS floppy disc into the drive. This disc must also hold GETFILE.EXE and PUTFILE.EXE.

5 At the DOS prompt type in:

```
GETFILE RAM:$.MYFILE MYFILE.DOC
```

(replacing MYFILE with the name of the file to be transferred).

6 If you are **transferring a file from DOS to ADFS** start up the PC Emulator and DOS.

7 At the DOS prompt type in:

```
PUTFILE MYFILE.DOC RAM:$.MYFILE
```

(replacing MYFILE with the name of the file to be transferred).

8 If you are in single task mode or using PCEmS, return to RISC OS by clicking Menu.

9 Insert the ADFS destination disc. Open a directory viewer for the RAM disc by clicking on its icon on the icon bar. Copy the file from the RAM disc to the floppy disc.

# A brief introduction to DOS

Below is a list of some of the most commonly used commands with a brief description. These commands are common to both MS-DOS and DR DOS. See the list of suggested DOS books for more information about DOS.

### CD (or CHDIR)

CD (or CHDIR) is used to change the current directory. For example:

```
A>CD A:\LETTERS
```

changes the current directory of drive A to the directory LETTERS in the root directory of drive A. The following example:

```
A>CD B:\BILLS\GAS
```

changes the current directory of drive B to the directory GAS in the directory BILLS on drive B.

### CHKDSK

CHKDSK is used to check that a disc is correctly set up. It displays the total amount of space on the disc, the amount of unused space remaining and the number of files stored. In addition to this, CHKDSK displays the amount of memory the emulator makes available as PC memory and the amount of that which is free for applications. For example:

```
A>CHKDSK /V
```

lists all files and their paths.

```
A>CHKDSK /F
```

allows you to fix any problems that have been identified.

### CLS

CLS is used to clear the screen.

### COPY

COPY is used to copy files or directories between drives on the system. For example:

```
A>COPY B:TEST.COM
```

copies TEST.COM from drive B to the current directory of drive A, while:

```
A>COPY B:\LETTERS B:\BILLS
```

copies the contents of the directory LETTERS on drive B to the directory BILLS on drive B.

### DISKCOPY

DISKCOPY copies the contents of the floppy disc in the source drive to a formatted or unformatted floppy disc in the target drive. For example:

```
A>DISKCOPY A: B:
```

copies the contents of the disc in A to the disc in B. In the case of a system with a single floppy drive, A: and B: are the same physical drive and you are prompted to change discs as necessary.

### DATE

DATE returns the system date and prompts for a new date to be entered. Note that the default date format is American ie MM/DD/YY. If you do not want to change the date, just press return.

### DIR

DIR is used to catalogue the current directory. DIR on its own lists the files one per line. The following example:

```
A>DIR B: /W
```

lists the files on drive B. The /W denotes that they are displayed five per line.

### ERASE (or DEL)

ERASE allows you to delete files from a disc (an alternative form is DEL). For example:

```
A>ERASE *.COM
```

erases all files with the .COM extension, while:

```
A>ERASE B:\TEST
```

erases all files in the TEST directory on drive B.

```
A>ERASE *.*
```

erases all files in the current directory.

### FORMAT

FORMAT is used to prepare new blank discs to store data and programs on. For example:

```
A>FORMAT B:
```

formats the disc in drive B. You will be prompted to insert the new disc before formatting starts.

```
A>FORMAT A: /S
```

formats the disc in drive A and copies the system files onto the disc, so making it bootable.

### MKDIR (or MD)

MKDIR (or MD) is used to create new directories on the disc. For example:

```
A>MKDIR BILLS
```

creates a directory called BILLS from the current directory, while:

```
A>MD B:\TEST
```

creates a directory called TEST from the root on drive B.

### RENAME (or REN)

RENAME allows you to change the name of a file. For example:

```
A> REN BILLS OLDBILLS
```

renames the file BILLS to one called OLDBILLS.

### RMDIR (or RD)

RMDIR deletes a directory from the disc. The directory must be empty before it can be deleted. For example:

```
A>RMDIR LETTERS
```

deletes the directory called LETTERS on the current drive (A).

### TIME

TIME returns the system time and prompts for a new time to be entered. If you do not need to change the time, just press Return.

### TYPE

TYPE allows you to display the contents of a text file on the screen. For example:

```
A>TYPE B:MYFILE.DOC
```

displays the contents of MYFILE.DOC on drive B.

### XCOPY

XCOPY copies complete directories, subdirectories and files. For example:

```
A> XCOPY ARCHIVE B:
```

copies the file ARCHIVE to the B drive.

```
A> XCOPY APPS B: /S
```

copies the directory APPS and any lower level subdirectories and files onto the B drive. It does not copy empty directories.

# Appendix A: The PC Emulator

## Compatibility

The compatibility of the emulator is very good. Many well known DOS titles have been tested and operate correctly. These include:

- Lotus 1-2-3
- dBASE IV
- Symphony
- Wordstar
- Microsoft C 5.1.

Since the emulator emulates the hardware and BIOS of the PC then it is possible to run other operating systems on the emulator. In addition to the version of DOS supplied with the emulator, the following operating systems have also been briefly tested with the PC Emulator.

- MS-DOS 3.21
- DR DOS 3.41
- DR DOS 5.00.

## The emulated PC – a technical description

For some DOS applications (particularly during installation), it is necessary to know the exact nature of the PC and what attached devices the PC Emulator emulates.

The emulated PC is basically an IBM PC XT, but in more detail the emulated PC contains the following components:

- Intel 80188 processor chip
- Intel 8087 maths coprocessor chip
- Intel 8259 interrupt controller chip
- Intel 8253 timer chip
- Intel 8237 DMA chip
- Intel 8255 IO chip.
- Sound connected via 8255 chip
- Enhanced 101 key US layout keyboard connected via 8255 chip
- Serial interface (Intel 8250 chip)
- Parallel interface (output only)
- 3.5 inch 720K floppy disc (BIOS level only)
- External 5.25 inch 360K floppy disc (BIOS level only)
- Hard disc (BIOS level only)
- Real time clock (BIOS level only)
- MDA (not PCEmS)

- CGA
- EGA (not PCEmS)
- EGA+ (not PCEmS)
- Two button Microsoft bus mouse
- RAM (maximum 640K)
- ROM BIOS.

EGA+ is a partial implementation of VGA hardware. It does not support the 256 colour mode of VGA and does not provide VGA BIOS support. If you wish to run Microsoft Windows 3.0, configure it for use with VGA and use the emulator's EGA+ mode.

Some PC devices are only emulated at the BIOS level. This means that the hardware of the device is not emulated, only the BIOS interface to the device. DOS programs that attempt to access the hard disc IO ports will fail because they are not emulated, but DOS programs that access the hard disc via the BIOS will work correctly. Other devices are emulated at the hardware level, for example, the graphics adaptors. Programs that access the graphics adaptor hardware directly will work correctly.

## Possible problem areas

### CGA Emulation in single tasking mode

Some monitors (and televisions via the TV modulator) will not operate correctly when run with a CGA display in single tasking mode (this is the only option with PCEmS). This is due to the field rate being 60Hz.

To cure this problem you should:

1 Load Edit onto the icon bar.

2 Open the application directory by holding down the Shift key and double clicking over the PCEm (or PCEmS) icon in the directory window.

3 Drag the file !Run onto the Edit icon. This display the contents of the file.

4 Comment out the line in the !Run file that reads:

```
RMEnsure ModesCGA 1.00 RMLoad <Obey$Dir>.ModesCGA
```

to comment out the line, type in the bar character ( | ) at the start of the line so that the line now reads:

```
| RMEnsure ModesCGA 1.00 RMLoad <Obey$Dir>.ModesCGA
```

5 Press F12 to access the command line. Type in:

```
RMKill ModesCGA
```

6 Press Return twice to display the desktop.

If you don't understand this procedure, contact your dealer.

This procedure removes the special 200 line screen mode and the CGA display will now use the standard 256 line screen mode; this results in a slightly smaller screen area.

### Matching DOS colours in RISC OS

The colours displayed on the emulator running in a window may not be those you expect. However the emulator chooses the closest colours that are available. True DOS colours are always shown in single task (full screen) mode.

### EGA Compatibility

The EGA graphics adaptor is a very complex device and it is possible to configure it in many ways other than the standard BIOS supported screen modes. It is possible some PC programs (games) using such non-standard register configurations, may not behave well.

### Parallel port

The parallel port supports output only.

### Using the PC Emulator with external 5 1/4" 80 track drives

To use external 5 1/4" 80 track drives with the emulator, edit the Choices configuration file by changing the line:

```
Floppy 5.25
```

to:

```
Floppy 5.25 DoubleStep
```

# Appendix B: Upgrading

## Upgrading from your existing PC emulator

### Floppy disc users

If you have a floppy disc only machine, use the !Merge application supplied on the emulator disc to merge the new System and Fonts applications with your current versions. Then use the new PC Emulator disc in place of your old one. Your data and applications will continue to work. Turn to page 2 for more information about !Merge.

### Hard disc users

The following instructions show you how to upgrade your PC Emulator:

1 Making a note of the pathname of the RISC OS file used by the emulator as a PC hard disc.

2 Delete the old PC emulator and its associated files from your hard disc. Do not delete your existing hard disc file.

3 Install the new PC Emulator by following the instructions in the chapter entitled *Installing the PC Emulator* on page 1. However do not create a DOS hard disc file, as you already have one.

4 Type the pathname of your existing DOS hard disc file into the Hard disc drive file box in the Configuration menu, see page 5 for details. Alternatively, set the Hard disc drive files option to greater than zero (so that the default pathname is displayed) and then drag the hard disc file icon onto the appropriate **Hard disc drive files** box. This changes the pathname to that of your disc drive file.

5 Save the new configuration and start the new emulator. The emulator will now boot using your existing PC hard disc partition.

If you are also going to upgrade your version of DOS, you should do so now.

## Upgrading from your existing version of DOS to MS-DOS 3.30

You should upgrade to the new version of the PC Emulator before upgrading your version of DOS.

### Floppy disc users

If you have a floppy disc only machine, you should stop using your old DOS system disc and any copies of the system disc you have made. You should also make sure that you no longer use any of the utilities provided with the old system disc. In place of the old DOS use the new DOS disc.

Your data and applications discs will continue to work.

### Hard disc users

When you upgrade your version of DOS you must:

- Use the SYS command to copy over the hidden DOS system files.

- Delete your old COMMAND.COM file and copy over the new version from the DOS system disc.
- Delete all your old DOS utilities (those that came on the DOS system disc) and copy over all the new DOS utilities.

Before you start this procedure it is recommended that you make a backup of your PC hard disc files on floppy disc.

The following instructions describe how to update to MS-DOS 3.30 on drive C:

1 Insert the MS-DOS 3.30 system disc into the floppy drive.

Start the emulator (by clicking on the PC Emulator icon). This will boot up MS-DOS 3.30

2 At the A> prompt, type in:

```
SYS C:
```

This will transfer the DOS 3.30 system files onto drive C, overwriting the earlier system files. If the old system is on a different drive, perhaps D, then type in SYS D:

3 Type in:

```
COPY COMMAND.COM C:
```

(assuming drive C).

4 Replace the old DOS utilities with the new utilities on the MS-DOS 3.30 disc.

5 Remove the floppy disc and reboot DOS.

The emulator should now boot with DOS 3.30.

**Warning.** The SYS command may not always work (this is a DOS problem). In which case you should choose one of the following options:

- If you have room on your hard disc, create a new DOS hard disc file and load the new version of the operating system onto this partition, then copy your files and directories from the old partition to the new partition. Don't copy the old DOS utilities over, use the new ones.
- Back up your existing hard disc partition and then reformat the partition using the new version of the operating system.

Do not use the DOS **BACKUP** command to backup your hard disc. It does not work consistently between DOS versions. You should use COPY or XCOPY to transfer the files and directories to floppy disc.

# Appendix C: Programming details

## Access to RISC OS

DOS programs can gain access to RISC OS by using a special (new SVC) 8086 opcode. This is an opcode that is unused on a real 8086 but the PC Emulator traps and uses it to communicate with RISC OS. The utility programs GETFILE.EXE and PUTFILE.EXE use this SVC opcode to transfer files between the RISC OS and MS-DOS filing systems. There is also a PC IO mapped device that allows RISC OS events to be seen by the PC and can cause the PC program to be interrupted if required.

## The SVC Opcode

The new pseudo 8086 SVC opcode has the following format:

```
FF FF nn nn
```

It is four bytes long, the first two bytes being hexadecimal FFFF the third and fourth bytes being a 16 bit number that indicates to the emulator what service is required. For example the SVC opcode to translate an 8086 address to an ARM address could be assembled in Microsoft MASM using.

```
dw      -1, 257
```

Only a few of the possible SVC numbers are actually used. Not all of the numbers that are used are described below as many are used for internal purposes. Only those SVC numbers described below should be used by a DOS application.

### SVC 257

Translate 8086 address to ARM address:

Entry:

```
ES:BX   8086 address
```

Exit:

```
DX:AX   32 bit ARM address
CY = 1 if error
CY = 0 if okay
```

### SVC 258

General purpose SWI:

Entry:

```
DX:AX = 'safe' (DH='s', AL='e')
ES:BX =  pointer to parameter block
```

Parameter block (must be dword, ie 4 byte, aligned)

```
dword 0          SWI number
dword 1          R0
dword 15         R14
dword 16         R15 (flags only, does not contain the PC)
```

Exit:

If the carry (CY) flag is clear then the parameter block is valid. In this case if the V flag in the returned R15 is clear the SWI was executed successfully and the parameter block will be updated with the values in the registers returned by the SWI. If the V flag was set, then the SWI failed.

If the carry flag is set then the parameter block is malformed. The top bit (bit 31) of the SWI number will be set, and the remainder of the SWI number will contain an error code:

0 – general failure

1 – invalid signature

2 – command block not in user RAM

3 – alignment error

4 – SWI number is out of range

5 – SWI number is protected

## The RISC OS PC Device

This is a PC IO mapped device at PC ports 0x700 and 0x701. It allows RISC OS events to be seen by the PC emulator.

An ARM Event 13 will generate a PC IRQ3. These will be queued (up to at least 4 entries). The RISC OS PC device allows the 8086 to examine the event registers.

### Port 700H

| | | |
|---|---|---|
| Read | bit 0 | set if interrupt requested |
| | bit 1 | set if overrun (event buffer overflowed) |
| Write | bits 0 to 1 | select byte within word (00 = LSB of word) |
| | bits 2 to 5 | latched register contents (r0 to r15) (only registers 0 to 2 can be read) |
| | bit 6 | must be zero (reserved) |
| | bit 7 | clears interrupt status, enables subsequent events |

### Port 701H

Read only ARM register content at the time of Event 13 being queued. The byte that is read is determined by writing to port 700H (see above).

# Appendix D: Further reading

ABC's of MS-DOS by A R Miller, published by Sybex.

IBM PC: An introduction to the operating system, BASIC programming and applicarion by L J Goldstein, published by Prentice-Hall.

IBM PC-DOS handbook by R A King, published by Sybex.

Understanding MS-DOS by K O'Day, published by Sams.

Mastering DOS: The complete tutorial and up to date user's guide by Judd Robbins, published by Sybex.

# Reader's Comment Form

*PC Emulator*

We would greatly appreciate your comments about this Manual, which will be taken into account for the next issue:

**Did you find the information you wanted?**

**Do you like the way the information is presented?**

General comments:

If there is not enough room for your comments, please continue overleaf

How would you classify your experience with computers?

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