Disc Image Manager

User Guide

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Version 1.44

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Introduction

Disc Image Manager originally started out as a Delphi class, TDiscImage, written for inclusion into Repton Map Display so that it could read Repton data files direct from disc images. To test that the class worked OK, and as a demo application as I released the source code into the public domain, I wrote a GUI front end for it called Disc Image Reader.

This project was still in Delphi so, therefore, Windows only. It was not until November 2020 that someone on the Stardot forum asked about accessing Acorn DFS images from MacOS. Owning a Mac myself, and with it being my main computer (relegating the Windows laptop to a secondary PC), I also noticed this hole in the 'market'. So, I decided it was time to port this across.

However, to do so, I needed to port the project into Lazarus (basically the free, multi-platform, version of Delphi). Previous attempts at using this product had failed, but this time I was determined. So, with Lazarus newly installed on my Mac, I then imported Disc Image Reader and, to my surprise, it worked with only a few minor changes. Finally, we had Disc Image Reader running on macOS. That became version 1.05, and further development commenced.

The first thing to add in was make the application write back to the images. I had already written the code to write back to a DFS image, but never tested it. And thus, Disc Image Reader became Disc Image Manager. It also found a new home on the Internet, at GitHub, in addition to my own website.

Roll onto the latest version and it has come on beyond what I expected it to be at the start. With the support, bug reports, and suggestions from the Stardot community, development has come on in leaps and bounds. So, I thank you all who use this for, well, using it, and I hope you find it useful.

What Is It and What Can It Do?

Disc Image Manager is an application for managing retro-computer disc images. Basically, you can read and write to them using a modern-day operating system. So, why would you want to do that? If you are asking that question, then you probably should not be here!

The formats it can deal with, as of the current version, are:

- Acorn Disc Filing System (DFS), including the Watford DFS variant, both single and double sided. Disc Image Manager can read and write to a DFS image, and create new, blank, images.
- Acorn Advanced Disc Filing System (ADFS). Disc Image Manager can read and write to all known formats of Acorn ADFS floppy and hard drive images – old map (8-bit ADFS and the original Archimedes format); new map (RISC OS 2 onwards); old directory (8-bit ADFS); new directory (from Arthur OS onwards); and big directory (RISC OS 4.39 onwards). As with DFS, it can also create new, blank, images both floppy and hard drive (up to 1GB).
- Commodore 64/128. The formats for Commodore 1541, 1571 and 1581 are all catered for, and can be read and written to. Again, new, blank, images can be created.
- Commodore AmigaDOS. Disc Image Manager can read and write to 'OFS' format floppies and hard drive images. Support for the 'FFS' format is not fully supported. International character mode and Directory caching support is yet to be implemented.

Blank image creation is supported, creating DD and HD floppies, and hard drives from 20MB to 1GB.

- MMFS. This part is still in beta and only a basic read from this format can be achieved.
- Acorn File Server (AFS). Disc Image Manager can now deal with Level 2 and Level 3 images, including "ADFS Hybrid" images, although this is untested on real or emulated systems.
- !Spark and !PackDir. Currently only !Spark (ZIP format) is fully readable and writable, while !PackDir is only readable.
- DOS Plus, as used on the BBC Master 512, and DOS. Disc Image Manager can read and write FAT12, FAT16 and FAT32, complete with Long Filename (LFN) support. As with other formats, blank floppy and hard drive images can be created, up to the limit of 1GB in size.

There are plans to add, in the future:

- Sinclair Spectrum+3.

Downloads

Disc Image Manager can be downloaded from GitHub:

https://github.com/geraldholdsworth/DiscImageManager/releases

Or from my own website:

http://www.geraldholdsworth.co.uk/index.php?link=DiscImageReader

I have supplied the binaries, either zipped or packaged, for the following OSes and CPUs:

- macOS 32 bit
- macOS 64 bit
- macOS M1
- Windows 32 bit
- Windows 64 bit
- Linux 32 bit
- Linux 64 bit
- Raspbian OS ARM (Raspberry Pi)

You can also contact me via the Stardot forum, or through email: gerald@geraldholdsworth.co.uk.

And the complete source code, ready for recompiling for any system that Lazarus (current version 2.2.0) will run on:

https://github.com/geraldholdsworth/DiscImageManager

Compatibility

Although not extensively tested on all systems, the provided binaries should work on the following systems:

Windows: XP, 7, 8, 10 and 11 (both 32- and 64-bit versions are provided). However, it has only been tested on Windows 10 and 11 64-bit.

Linux: This has been tested on Linux Mint Cinnamon 64 bit, and Raspbian OS 32 bit.

macOS: Leopard to Big Sur, but I have only tested on High Sierra, Catalina and Monterey. Others have reported it working OK on Mojave.

It has also been lightly tested with 'High DPI' setups – i.e., under Windows or Linux you can magnify the screen beyond 100%. I have not found a way of doing this under macOS yet.

Thank you

Many thanks to the users and contributors of the Stardot forum whose feedback and advice has been greatly appreciated. Also, a big thank you to Jasper Renow-Clark who helped me with the ADFS formats in the beginning, before this project started.

This project was conceived as a module to the Repton Map Display application, with this application just being a demo (and for me to try the code out with). In December 2020, it became the Disc Image Manager.

Additional thanks go to Robert Sprowson for his help with working out the parameters for ADFS Hard Drive images, and to David Pilling for his help with the Spark module.

Suggestions, bug reports, or whatever please do not hesitate to email me on gerald@hollypops.co.uk, or contact via Stardot forum.

Installation and Basic Usage

All the pre-built binary downloads are provided in either a ZIP archive (Windows and Linux) or a DMG file (macOS). To install them, just open the archive/package and drag the application to wherever you wish it to be. It is just a single file (well, directory in the case of macOS) and can be run anywhere. There are no special installers, or anything special you need to do. It will just run. OK, you might get an annoying little message from the OS saying it is not from a registered developer, but once past that, it will just run.

Using Disc Image Manager

Once you have it running you will be presented with the main window (note that all screen shots are taken from the macOS version). Along the top, in Windows and Linux, will be the main menu bar (this is located on the macOS menu bar at the top of the screen, in macOS). Below this will be the tool bar. All the buttons in the toolbar are replicated through the main menus and, for some, also in the context menu (more on this later).

Below this will be two panes – Image Contents and File Details. The former will display the contents of a disc image, while the latter will display the file (or directory) details on the selected file (or directory).

Finally, along the bottom is the status bar which gives various information about the opened image.

Layout
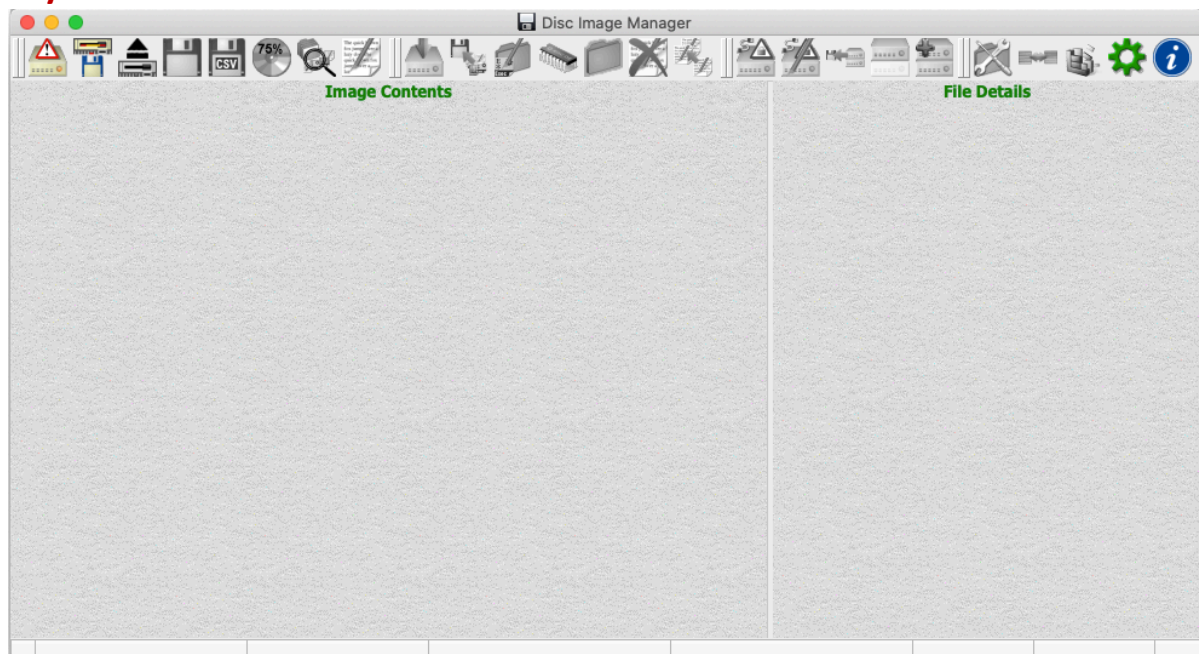
The toolbar buttons are split into four categories, each on its own toolbar which can be hidden using the menus. These are, by default, from left to right:

- **Image** toolbar
- **Files** toolbar
- **Partition** toolbar
- **Tools** toolbar

The order of the toolbars can be changed around just by clicking and dragging on the double vertical lines on the left of each one. The buttons in each tool bar are:

Image Toolbar

- **New Image File**: creates a new image.
- **Open Image File**: opens an image file.
- **Close Image File**: closes the currently open image.
- **Save Image As**: Saves the currently open image.
- **Save File Details As CSV**: Saves the file details, of all the files on the image, as a CSV file.
- **Display the Free Space Map**: Displays the free space map, along with some other details about the image. It will also allow you to change some of these details.
- **Open File Search Window**: Allows you to search the image for one or more files or directories by filename or filetype.
- **Show Image Report**: Displays low level details about the loaded image.

Files Toolbar

- **Download File(s)**: Allows you to extract (download) files from the image onto the host filing system.
- **Add File(s)**: Does the opposite of the above.
- **Rename File**: You can rename a file or directory here.
- **Show File Viewer**: This will show you the contents of the selected file. This will include a hex dump but may also include other views.
- **New Directory**: Creates a new directory on the image, depending on the format.
- **Delete File**: Removes a file (or directory) from the image.
- **Duplicate File**: Clones a file within the same directory.

Partition Toolbar

- **Add Password File**: Creates and adds a new password file for Acorn File Server images.
- **Edit Password File**: Allows Acorn File Server password files to be edited.
- **Delete Partition**: Deletes an Acorn File Server or DOS partition from an ADFS Hybrid, or one side from a double sided DFS image.
- **Save Partition**: Saves either the ADFS, the Acorn File Server, or the DOS partition as a separate image. This will also save either side of a double sided DFS image as a single sided image.
- **Add Partition**: Adds a new Acorn File Server partition into an ADFS 8 bit image.

Tools Toolbar

- **Repair Broken ADFS Directories**: This tool will find and attempt to repair any broken directories on an ADFS disc.
- **Change Interleave Method**: This tool, for ADFS L, ADFS/Acorn File Server Hybrids, and Acorn File Server images, can be used to change how the data is laid down within the image file.
- **Defrag**: Simply…defragments the files on the image (similar to *COMPACT with ADFS).
- **Preferences**: Customise various aspects of the application.
- **About Disc Image Manager**: What it is, who wrote it, what version and some other information.

The status bar, along the bottom, will give this information (when an image is opened), from left to right:

- **Modified**: Displays a small icon ⊙ if the image has been modified since the last open/save.
- **Image format**: What system the image is for, along with what 'shape' it is.
- **Disc title**: If available, the title of the disc, of the currently selected partition/side.
- **Capacity**: The maximum capacity of the image, or currently selected partition/side.
- **Free Space**: The amount of free space left on the image, or currently selected partition/side.
- **Single/Double Sided**: Indicates whether this is a single sided or double sided DFS image. Blank if not DFS.
- **ADFS Map Type/Amiga FS type/DOS type**: Indicates whether the ADFS map is old or new; the AmigaDOS is OFS or FFS; or the DOS is FAT12, FAT16 or FAT32.
- **ADFS or Amiga Directory Type**: Indicates whether this is an ADFS old, new or big directory, or if it is an Amiga directory or directory cache.

As discussed earlier, the four toolbars can be hidden. The File Details pane on the right (see next chapter) can also be hidden, as can the status bar along the bottom, using the 'View' menu.

# Working With an Image

OK, so let's open an image. There are three ways of doing this – either click on the toolbar button, through the main menu or, simply, just by dragging the file over the main window and dropping it. At this point, I will point out that you can do most things by dragging and dropping, or by not using the menus or toolbar.

Assuming it is a file that Disc Image Manager recognises and supports, you should get a populated display:
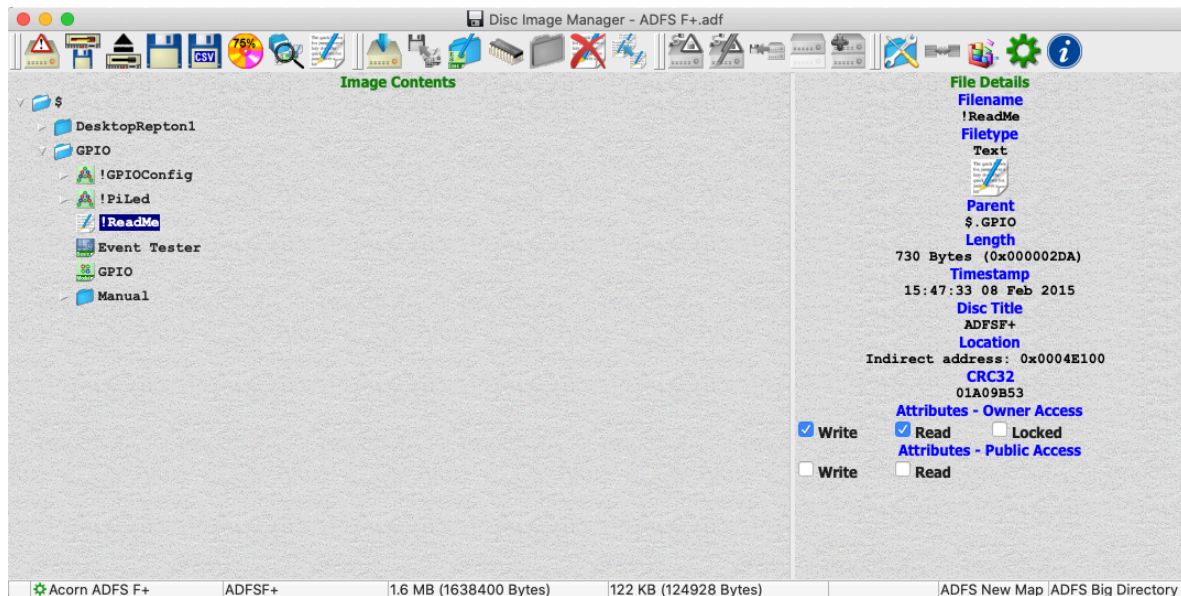
Now we have one open we can look at the two panes in greater detail. Incidentally, you can resize the main window by clicking and dragging one of the edges or corners, and the two panes using the vertical sizer between them.

Image Contents Pane
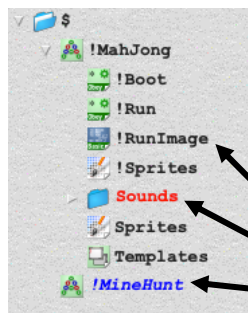
This shows the contents of the image in a tree format. You can slow double click to rename it. A directory can be expanded or contracted using the little arrow to the left of the item (if it has any children).

Some directories have different colours and font styles:

- Black shows normal objects.
- Red shows a broken directory in ADFS.
- Blue, and in italic, shows a directory which has yet to be read in (see preferences later).

Additionally, a file may be in green, meaning that it is the currently open DOS partition. These files cannot be deleted.

Items can be selected, and their details will show up in the File Details Pane on the right. Right clicking on an item will bring up the context menu, which replicates the file functions in the main menu and tool bar.

File Details Pane
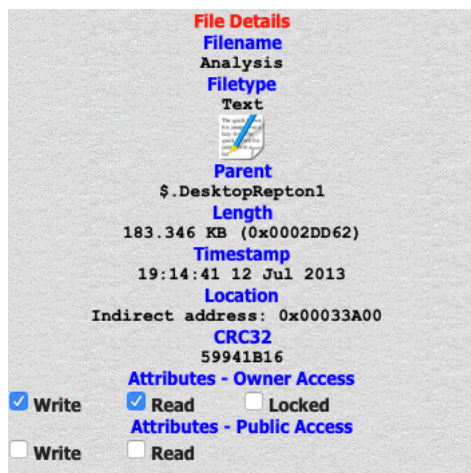
Some of the fields displayed will be editable, while the others you can copy to the clipboard just by clicking on them.

The Filename, Parent, Length, Location and CRC32 can all be copied to the clipboard (renaming a file or changing its parent will be covered later).

The Filetype, Timestamp, Directory Title, Load address and Execution address can be changed by clicking on them. The Attributes can be changed just by ticking, or unticking, the appropriate box.

Not all fields will be available for all files on all systems. As you can see here, the Load and Execution addresses are not available as they are encoded for the filetype and timestamp. And the Directory Title is not available because we are looking at a file. The format of the location will also change depending on the file system.

Changing The Details

So, let's start by changing the filetype. Click on the filetype text or icon to open a small menu window:

This will list all the filetypes known to the application (in fact, it lists all those that are known and there is a filetype icon available). Right at the end is an editable field for entering a filetype other than that listed. Just click on the desired filetype, or enter your own and press Enter, to change.

To change the Directory Title, again just click on it to make the field editable (unless, like here, it is an ADFS '+' format that does not have directory titles). Press Enter once you are happy with your change. Changing the Load & Execution addresses, and timestamp, are done in the same way.

Renaming a file is achieved by slow double clicking on the file – this means, click to select a file, then click again to turn the filename editable. If you are too fast, it will open the file viewer (more on this later). Press Enter to finalise the change.

If, with any of these changes, they are invalid to the file system, then they will revert. So be aware of the filing system restrictions (e.g., DFS filenames are 7 characters in length, maximum). You will also find that you will not be able to do any edits when you have multiple files/directories selected.

Free Space Map

There are some more changes you can make, but these are achieved through the free space map window:
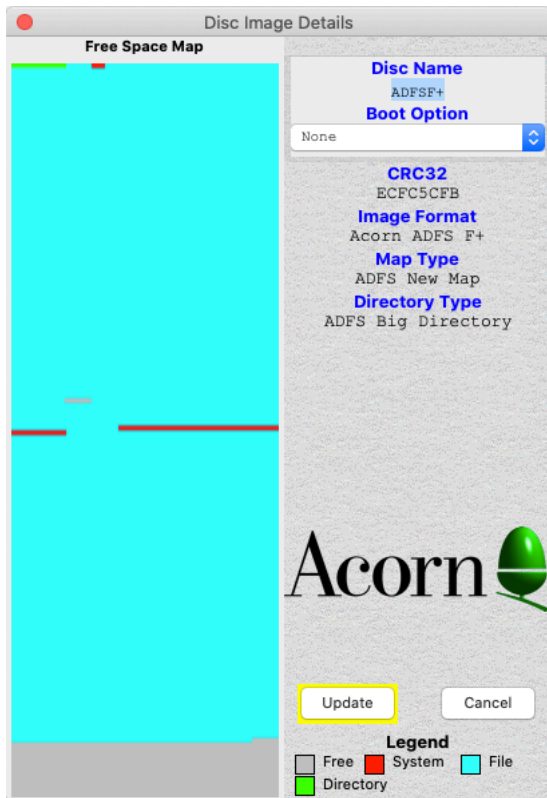
On the left-hand side, you will find a nice graphical display representing the disc. It will show free space, space used by files, space used by directories and space used by the system.

On the right-hand side the disc name and boot option will be displayed, along with a repeat of some of the image's information.

The Disc Name and Boot Option are editable, and you can simply click on them to change. Once you are happy with your changes, click on Update to make the change. Clicking on Cancel will forget all changes in this window.

If you have a double sided DFS image open, you will get two free space maps, and two boxes for the Disc Name and Boot Option.

Not all formats will give this display and, therefore, are not editable.

Below this will be, depending on format:

- **Image Format**: Textual representation of what the format is;
- **Map/FAT Type**: For ADFS and Amiga, the type of map, and DOS for the FAT type;
- **Directory Type**: For ADFS and Amiga, the type of directory;
- **Interleave Type**: For DFS double sided, ADFS 'L', and Acorn File Server, the interleave method used to open this image;
- **CRC32**: The CRC32 number so you can quickly check if the file is the same as another.

Downloading (Extracting) Files

One thing that most people will want to do is to get files off the image and onto the host filing system. At the time of writing, dragging a file out of the application is not possible. So therefore, we are left with the other option of using the toolbar button, or the main menu. You can also right click to open a context menu which will have this option listed (along with Rename).

Select the file, or files, you wish to download and use your preferred method (toolbar/main menu/context menu) to open the Save As dialogue box. This is an OS derived dialogue so will behave as others do on your operating system. So simply navigate to where you want to download these files to. When they are downloaded, they will have an 'inf' file alongside (unless you have selected not to – see Preferences). This gives other information about the file (such as load and execution addresses) which would otherwise be lost. Full details about this file can be found at the end of this guide.

Adding Files

Another operation that people will want to do is to add files, from the host operating system to an image. This can be done by dragging and dropping, just like opening an image. Disc Image Manager will also take account of any 'inf' files and skip over such files if they are part of the selection – I have seen similar utilities to Disc Image Manager that attempts to import the 'inf' files if they are selected.

You may find that the toolbar button, and menu item, for adding a file is greyed out. This is because a file can only be added if a directory is selected, where it will be added to that directory. Dragging and dropping a file will automatically select the root if none are selected.

Import of Another Image Contents

Something to watch out for – if you have an image open and you drag another image in, Disc Image Manager will recognise this and ask you if you wish to import the contents into this image. You might have wanted to open the new image or import it as a file. Well, you are given these options too. If you choose to import, then the following dialogue will open giving you the option of which files to import and which to leave:
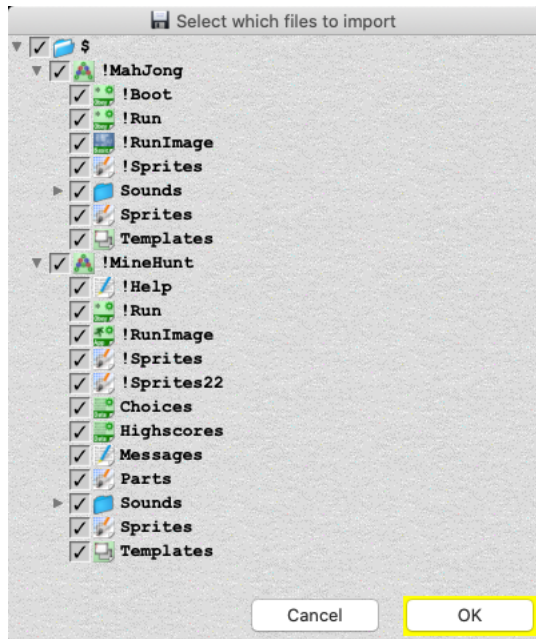
Just simply untick those which you don't require and tick those that you do. You will find that as you tick, or untick, items the parent directory will change from ticked (☑), or unticked (☐), to an intermediate state (⊟).

Also, ticking, or unticking, a directory will cause all the contents, including any sub-directories and their contents, to be ticked or unticked. It can therefore be seen that if you tick the root ($) then the entire contents will be selected, and conversely, unticking the root will cause the entire contents to be deselected.

Once you are happy with your selection, just click on OK to commence the import, or Cancel to cancel the entire operation.

Disc Image Manager will check to make sure that the current open image is of a format suitable to receive the contents and a warning is issued if not. During the import any errors are ignored and skipped but logged and reported to the user once the operation has completed.

Converting Two Single Sided DFS Images to Double Sided

If you have a single sided DFS image open and you go to add another, as above, you will get a different prompt – that of whether to import the contents (as above), or convert the currently open image to a double sided image, with the incoming image as the second side.

Adding the Contents of a SparkFS or PackDir archive

Disc Image Manager is, by default, set to treat SparkFS and PackDir images as a filing system and, hence, will open them normally. However, Disc Image Manager can be configured to treat these as a file.

In these cases, if Disc Image Manager recognises the file as a Spark or PackDir archive it will inflate and add the contents (if you wish). But if the uncompressed contents do not fit on the disc, you will not get the option and the file will be added as is instead.

Deleting Files and Directories

To delete a file or directory, just select it and click on Delete File (either from the toolbar, main menu, or context menu). A word of warning – if you have multiple files or directories selected, then they will all be deleted, and if you have a directory selected then the entire

contents, including sub-directories, will be deleted. But you will be presented with a confirmation box before this happens.

Creating a New Directory

This is very simple – just click on Create Directory toolbar button, or use the appropriate menu item, and a new directory is created (if the filing system supports directories). It will be given a default name which you can then change using the rename procedure above.

Copying and Moving Files

Files can be copied from one directory to another or, in the case of DFS, from one side to another. They can also be moved. This is done a similar fashion to the host operating system. However, at the time of writing, copying to the clipboard then pasting back is not available.

In the directory listing pane (Image Details), select a file, directory. Then you can just drag it to the desired directory (side) on the same image. While in the drag/drop operation, pressing CTRL (Windows and Linux) or ALT (macOS) will result in the file being copied (indicated by the plus icon ⊕), while pressing SHIFT will result in the file being moved. The destination directory is indicated by it being selected, and opened if not already done so, as you hover over it. Once happy with the destination, just drop the file.

Copying files into the same parent directory (you cannot move files into the same parent as this would be pointless) has the effect of cloning the file. Currently, this cannot be done with directories. This cloning operation can also be achieved by using the toolbar button, main menu item or context menu item.

At the time of writing, only single files, or directories, can be operated on in this fashion.

Searching for Files

Clicking on the Search button will open the File Search dialogue box:
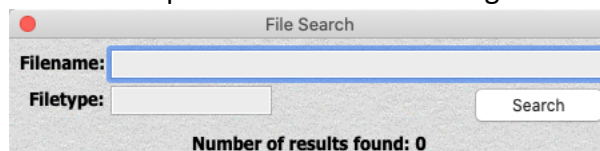
Just enter your search criteria and press Enter or click on Search. Both fields can be filled out if you so wish to search on both simultaneously. You can use wildcards:

- '#' will match any single character: 'a#c' will find 'abc', 'acc', 'adc', etc.
- '*' will match zero or more characters: 'ab*' will find 'ab', 'abc', 'abcd', etc.

The search is case-insensitive, so 'abc' is the same as 'ABC' and 'Abc'.

The results will be listed below:
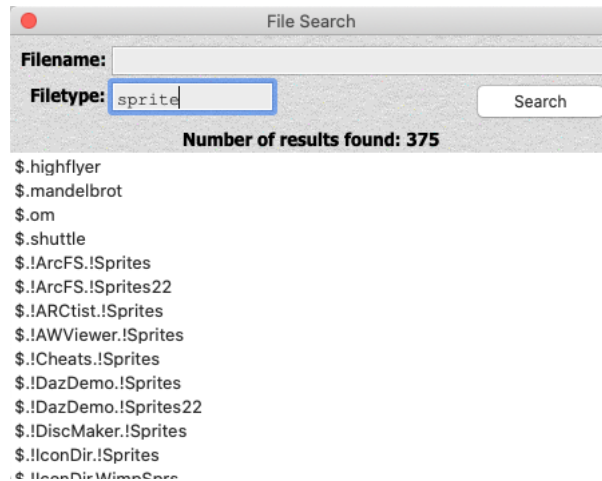
Double clicking on one of the results will select it in the main window.

Note that if you have selected the option not to scan sub directories when opening, then only the directories which have been 'seen' will be searched in.

Repair ADFS Broken Directories

Disc Image Manager will attempt to open and display ADFS directories if they are broken or not. Directories will be displayed, on the right-hand pane, as broken along with an error number. At the time of writing, the following will attempt to be repaired:

- Broken directory due to the start and end sequence number not matching: When ADFS writes to a directory, it updates the sequence number (the number in brackets at the top of a directory display in 8-bit ADFS) at the head of the directory, makes the write, then updates the sequence number in the tail. This means that if anything happens during the write, it will result in a broken directory. Bit 0 of the error code is set in Disc Image Manager (0x01).

- Broken directory due to the start and end identity name not matching or incorrect (old and new directory): In ADFS, directories are identified by the string 'Hugo' (after Hugo Tyson) or 'Nick' (after Nick Reeves). There is an id in the header and the tail. Bit 1 of the error code is set in Disc Image Manager (0x02).

- In addition, if the start or end do match but are not 'Hugo' or 'Nick' (old directory) then bit 6 of the error code will be set (0x40).

- Broken directory due to the start and end identity being incorrect (big directory): As above, but with big directories the id is 'SBPr' in the header and 'oven' in the tail (after Simon Proven). Bit 2 of the error code is set in Disc Image Manager (0x04).

- Broken directory due to incorrect cyclic redundancy check: To ensure the integrity of the directory a CRC is calculated based on the contents and stored in the tail. Old directories this can be zero. Bit 3 of the error code is set in Disc Image Manager (0x08).

- Broken directory due to the directory not being sector aligned: Bit 5 of the error code is set in Disc Image Manager (0x20).

There are some other cases that will cause a broken directory, which will set bit 4 of the error code, if detected (0x10). The main one is the use of interleaved images (mainly with ADFS 'L' shape discs). If a disc is read in and assumed interleaved where it is not, then the result will be broken directories. Disc Image Manager will detect these, as the directory will not be where it should and therefore is unlikely to be able to be repaired. We will cover interleaved images later.

In addition, Disc Image Manager will only repair those directories that have been 'seen'. So, by selecting the option not to scan sub directories on opening can affect which directories are fixed.

Change Interleave Method

As alluded to above, and covered again in Preferences, the interleave method can be quite important. For example, an ADFS L image is expected to be interleaved when read by BeebEm. If it is not, ADFS in BeebEm will report that the image is bad (or, rather, that it has broken directories). Now you would think that, therefore, all ADFS L images you come across are interleaved…but, the reality is, they are not.

So, using this tool, you can change the interleave method from the currently detected (or forced – see later) method to another method. You will not see any difference in the display in Disc Image Manager, aside from the Image Details dialogue will report what the current interleave method is.
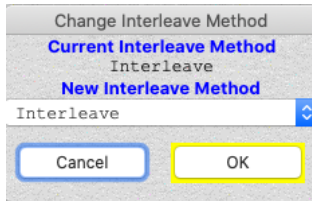
Defragmenting

The way files are saved onto images is to store them in a fixed size allocation unit. You may have come across the term "Large File Allocation Unit", of LFAU for short, when formatting hard drives. This is the smallest size that a file can take up on a disc.

With fragmented formats (such as New Map ADFS, Acorn File Server, and Commodore formats) the different fragments of files can be scattered across the disc's surface, with each fragment taking up a minimum of an LFAU (although New Map ADFS introduced the concept of sharing).

Another example would be, for example with DFS, where a file is deleted. This leaves a 'hole' in the free space map. When a smaller file is subsequently saved, this will be inserted into this 'hole'. But, if a bigger file is saved, this will not fit in the 'hole', so a bigger 'hole' is needed to be found.

The defrag feature of Disc Image Manager simply clones the partition or side (as this can work on multi-partition images), deletes everything in the original, then re-imports all the files back in, thereby re-organising them and effectively defragmenting the image.

Working With Partitions/Sides

There are some formats that Disc Image Manager can deal with that have a second partition. This second partition is usually of a different format. Currently, those images are double sided DFS (where the partitions are called sides, as they are different sides of a physical disc), ADFS with Acorn File Server Hybrids, and ADFS with DOS Plus Hybrids.

By Acorn FS nature, the format is usually stored with an ADFS header anyway (Level 3), so having an ADFS directory structure in addition to an Acorn FS part is not that uncommon.

Disc Image Manager has some functionality to deal with these partitions. The Acorn FS partition of an ADFS/Acorn FS Hybrid has, as the root, 'AFS$' (as opposed to '$') to distinguish it from the ADFS root – this becomes important when searching for files. The partitions can also be saved out, separately, or deleted, separately. This includes converting two single sided DFS images to a double sided image (as noted above) and splitting a double sided image into two single sided images.

A partition, or side, can be saved out as a separate image using the 'Save Partition' button (or 'Save Side'), or it can be removed from the image using the 'Delete Partition' button (or 'Delete Side'). Both operations are, in effect, the same thing.

When splitting ADFS/Acorn FS partitions in this way, the Acorn FS partition will mark up the entire part where the ADFS was as used space, instead of shuffling all the files around. The ADFS partition, however, will clear the Acorn FS partition and mark it as free space. If you wish to shuffle the files around, it might be easier to import the resultant Acorn FS image into a new, blank, Acorn FS image.

Note about Acorn File Server

It was discovered that Acorn changed the layout of the Level 3 format around 1988. As of version 1.39 of Disc Image Manager, you can no longer create an image or partition greater than 127MB in size, until this format is figured out and documented.

Adding an Acorn File Server or DOS Plus Partition

You may want to add an Acorn FS or DOS Plus partition to an existing ADFS image. This can be done using the Add Partition button. This will only work with the 8-bit variants (i.e., Old Map/Old Directory). The maximum size is determined by the amount of free space left on the image, and you will be able to select how big you want the partition to be:
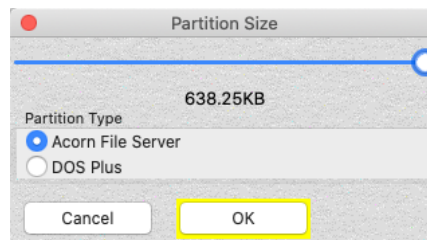
The minimum size will be 9 sectors, or 2.25KB. This is to allow for the two Acorn FS headers, the root directory and the root header, the map, and a bit of space to make it useful. This is also enough space for a DOS Plus FAT, the root, and some useful space. The resultant image will use the same interleave as the donor image, either automatically detected, or specified through the preferences page.

Acorn File Server Password Files

One feature of Acorn File Server is the use of password files to allow certain users access to the server. These files are not required to be present. But, if you have an image without one (or create an image without one – see next chapter), you can add one by clicking on the 'Add Password File' button. This just adds a basic file with the 'Syst' user.

If the image already has such a file, this can be edited by clicking on the 'Edit Password File' button:
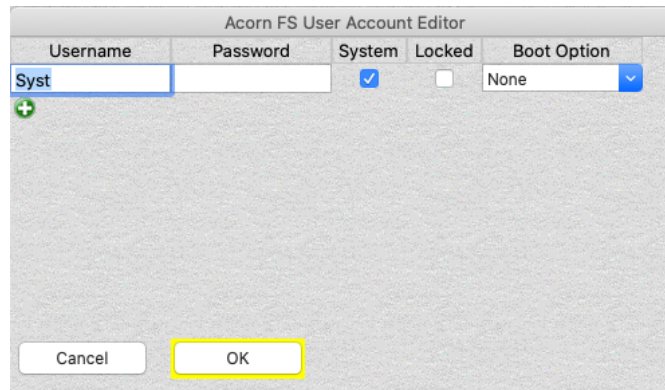
This will list, in the order of appearance in the file, all the usernames, passwords and their attributes. There is no checking for duplicates, with the only check being that Syst must exist, somewhere, and that it is a System account.

The locked option is only valid for Level 3 systems, and the username length varies between Level 2 (10 characters) and Level 3 (20 characters).

Clicking on the plus icon will add another row. To remove an account, just blank out the username. These entries will be skipped when OK is clicked.

Removing or Saving a Partition

Clicking on the Save Partition As button, while a hybrid image is open, will save the selected partition as a separate (and non-hybrid) image.

Saving the ADFS partition will result in extending the ADFS image size, so it takes over the entire space where the other partition existed. Saving the Acorn File Server or DOS partition will just result in the partition, with no resizing. This operation does not change the original image.

Similarly, clicking on Delete Partition will remove the selected partition resulting in the other partition being the sole file system on the image. This operation will change the original image.

Both buttons can be used with double sided DFS images to split them into single sided images. However, because of the way that Commodore 1571 images are laid out, it is not possible to split these into 1541 images or join two 1541 images into a single 1571 image.

NOTE: The separating of the Acorn File Server partition is still under development and currently does not result in a viable image. In addition, if a DOS partition does not have a viable header, then this will not be created on the resultant image.

Creating a New Image

Disc Image Manager can create new, blank, images. These can then either be used to add files to, or for use in an emulator. To do this, click on the New Image button to open the New Image Dialogue box:
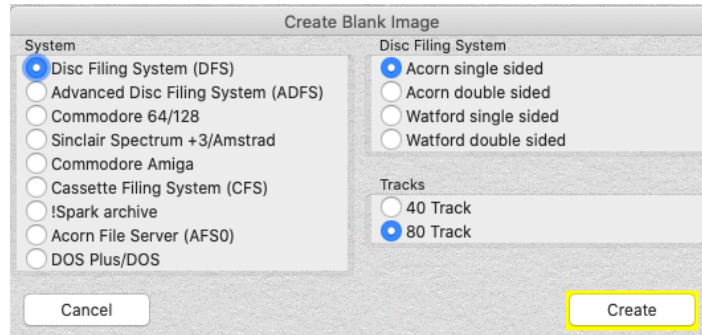
Simply just select the System on the left-hand side, then the format on the right-hand side. Some formats are unavailable and will cause the Create button to be greyed out.

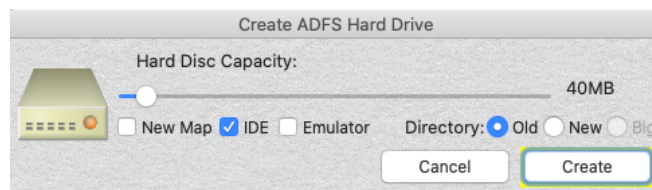Once the new image has been created, it will be displayed in the main display window and the root will automatically be selected.

ADFS Hard Drive Image

Selecting to create an ADFS Hard Drive, and clicking on Create, will result in a further dialogue box:

Here you will need to specify the size (minimum of 20MB, maximum of 1GB), map type (New map or not) and Directory type (Old, New or Big). Some ADFS restrictions:

- You can only have an old or new directory with an old map.
- You can only have a new or big directory with a new map.
- Old map only supports up to, and including, 512MB. Above this it will be new map.

The maximum size of 1GB is purely down to memory restrictions. At the time of writing, Disc Image Manager loads the entire image into memory. Once the code is changed so that it opens and accesses the image directly from the disc, the 1GB upper limit can be removed.

The option 'IDE' will adjust the disc record for IDE images, otherwise they will be adjusted for ST506 images. This is only valid on new map images. The option 'Emulator' will add a 512-byte header, full of zeros, at the top of the file.

Clicking on Create will then create the hard drive image.

DOS Hard Drive Image

Similar to the ADFS Hard Drive image creation, a DOS Hard Drive can be created, and works the same as ADFS.

The maximum size will change depending on the FAT type you select:

- FAT12 maximum size is 500MB (with 512byte sectors)
- FAT16 maximum size is 1000MB (with 512byte sectors).
- FAT32 is restricted to 1GB, like ADFS.

Commodore Amiga Hard Drive Image

Sometimes referred to as a 'hardfile', this will simply create an HDF file for use in an Amiga emulator (for example, FS-UAE). The file system is automatically selected to be Fast File System.
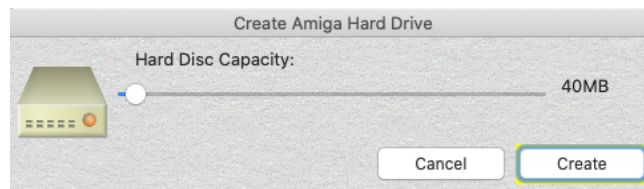
Acorn File Server
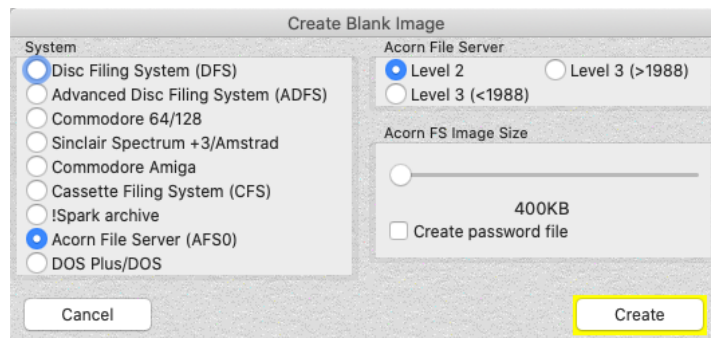
Clicking on Acorn File Server will present you with an option for the image size and whether you wish to create a password file (with just the 'Syst' username in).

The minimum capacity, for Level 2, is 400KB and for Level 3 is 640KB, while the maximum is 500MB.

Note: The maximum Acorn File Server size is temporarily restricted to 127MB for technical reasons, and the two Level 3 options will result in the same format currently.

The File Viewer

Double clicking on a file will open it in a separate window as a hex dump, allowing you to see the contents. But, if Disc Image Manager recognises this file as something it can display, it will:
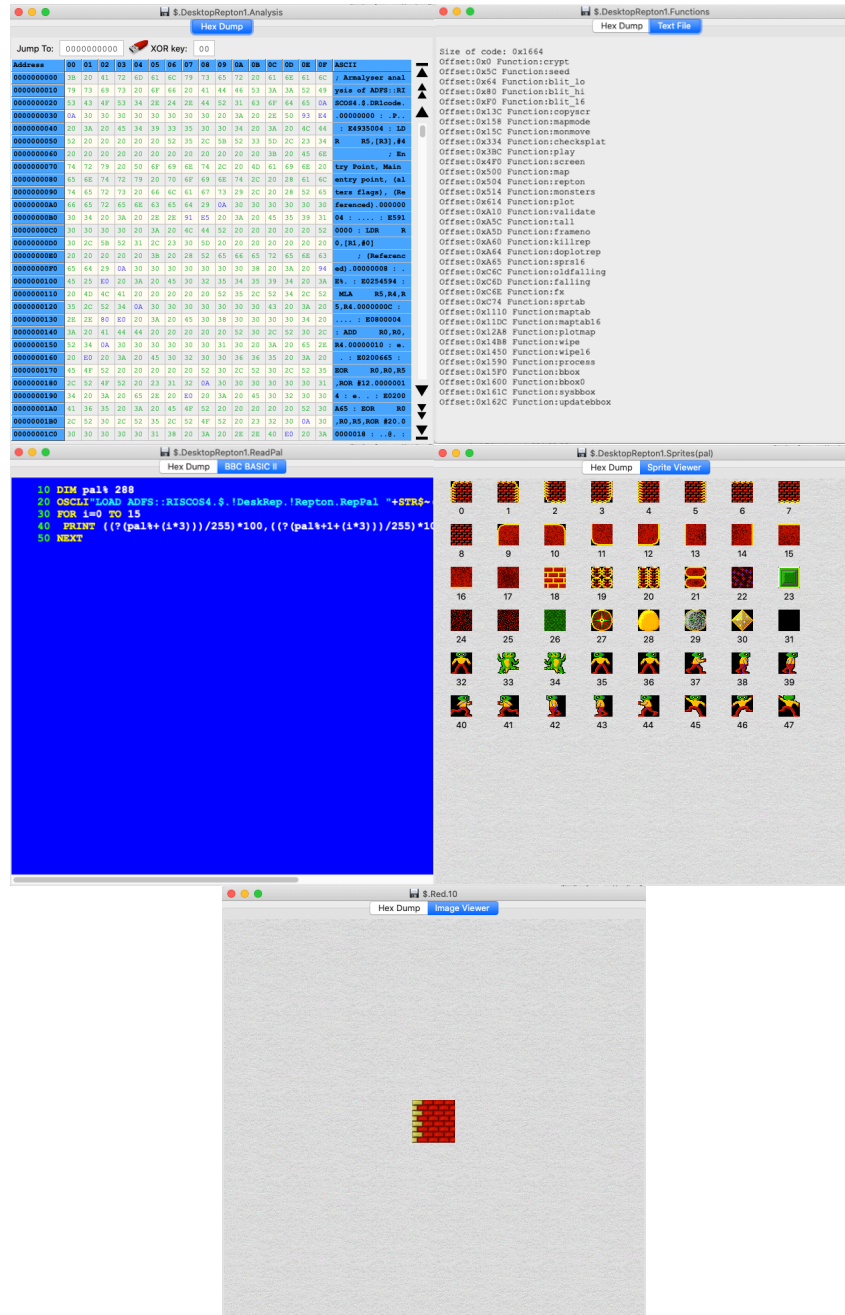
Above we have, from left to right and top to bottom:

- Hex dump view: Every file will have this. Accessible via the 'Hex Dump' tab at the top.
- Text view: If Disc Image Manager determines that the file is pure text (only contains characters in the ASCII range 32-126 or 9, 10 or 13) then it will display it as text.
- BBC BASIC view: If Disc Image Manager determines that the file is a BBC BASIC file, it will detokenise and prettify the BASIC file.
- RISC OS Sprite view: If Disc Image Manager determines that the file is a RISC OS sprite file, the contents will be displayed as such.

- Image view: Other image formats (Windows Bitmap, PNG, or JPEG) will be displayed here.

Preferences

Clicking on the Preferences button (or using the main menu) will open the dialogue box so that Disc Image Manager can be customised.
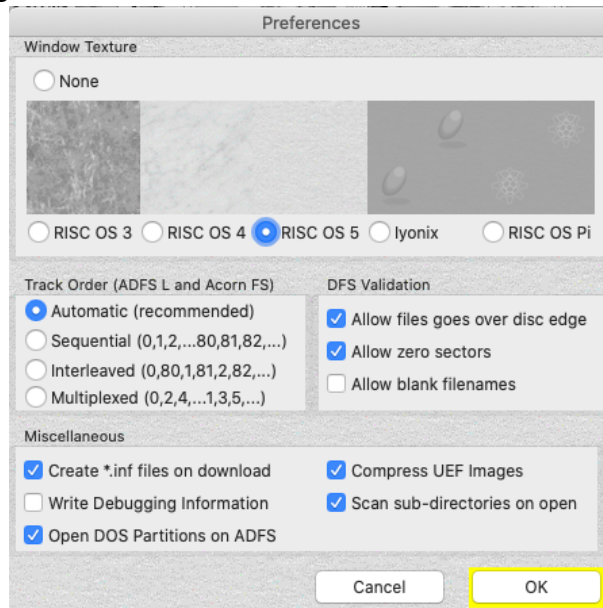
The options available here are:

Window Texture

There are six options for the background texture of each window within Disc Image Manager:

- None: all windows will have a plan background;
- RISC OS 3 style;
- RISC OS 4 style;
- RISC OS 5 style;
- RISC OS on Iyonix style; and
- RISC OS on Raspberry Pi style.

Track Order

We touched briefly on interleaving earlier on. This is done on all DFS Double Sided images, most ADFS 'L' images, and some Acorn FS images. As pointed out earlier on, if an ADFS L image is loaded as interleaved but is not interleaved, then it may well result in some broken directories. This is how the Automatic option works – it tries loading the image as interleaved and counts the number of broken directories. If there are any, it reloads it as multiplexed. Then, if there are still some broken directories, it tries sequential, before going back to interleaved. The other three options force the loading using a specific method.

- **Sequential**: This is where the track order is one after the other. E.g., 0,1,2,etc all the way up to track 159 (for a double sided 80 track image).
- **Interleaved**: This is where the track order swaps between sides. E.g. track 0, side 0; track 0, side 1; etc.
- **Multiplexed**: This is where the drive double steps to the next track. So, you get the even tracks first, then the odd tracks.

DFS Validation

DFS images are very simple and have very little to go on when ID-ing them. Because of this, the automatic ID process will assume a few factors, which can be toggled on or off with these options.

- **Allow files goes over disc edge**: This will ignore any files where the sector + length would take it beyond the edge of the disc.
- **Allow zero sectors**: This will allow DFS images that specify a zero number of sectors (and, hence, an image length of zero). Because this means that Disc Image Manager will accept a 512-byte file full of zeros as a legitimate DFS image. This also may cause issues reading in other formats, which is why this option has been provided.
- **Allow blank filenames**: This will allow DFS images with blank filenames.

Miscellaneous

- **Create *.inf file on download**: Specify whether to produce an inf file or not when downloading (extracting) files from images to the host filing system.
- **Write Debugging Information**: Create and update a file in the temporary area of the operating system (called '*DIM_LogFile.txt*') to write any debugging information from the application.
- **Compress UEF images**: Most UEF images are GZipped. Disc Image Manager will also GZip any UEF images unless this option is not ticked.
- **Scan sub-directories on open**: When opening an image (typically ADFS, Amiga, Acorn FS or DOS Plus) Disc Image Manager will read the entire directory structure. If the image has a lot of directories, this may take some time to open. Hence, this option can be turned off and then directories will only be read in as and when needed.
- **Open DOS Partitions on ADFS**: When an ADFS hard drive image (old directory) is opened, and it contains a DOS file (typically named 'DRIVE_C'), this will be automatically found and opened as a DOS partition. Unticking this option stops this happening. DOS partitions on ADFS floppy images are still opened.

Clicking on OK will save these settings to the registry and apply them instantly or, in the case of the *Track Order* option, the *Scan sub-directories* option, or the *Open DOS Partitions on ADFS* option the next time an image is loaded.

Command Line Options

Disc Image Manager can be used by passing commands on the command line, and so therefore not utilising the GUI.
The command line options are:

Commands take the form <command>:<parameter1>|<parameter2>|...
Parameters in square brackets [] indicate optional parameters.
Any parameters containing spaces should be contained within double quotes (").
Any unrecognised commands, or insufficient number of parameters, will be ignored.

Add files to the image
`--add -a`
Parameters: <OS filename>[|<destination>][|<FS filename>][|<load address>][|<execution address>][|<attributes>]

Adds files specified in <OS filename>, which can be wildcarded, to the open image in <destination> directory. Assumes drive 0 and root if nothing selected or not found. The filename to be used on the image can also be specified, along with the load address, execution address and attributes. Addresses should be in hex, and the attributes can either be in hex or as text as per access command below. If the optional parameters are specified, then this overrides anything contained within the related 'inf' file, if this exists.

Set attributes for specified file
`--access -ac`
Parameters: <FS filename>|<attributes>

Sets the attributes (access rights) to the file or directory specified. <attributes> can be a string containing any, or all, of the following (in any order):

Bit	Attribute	Meaning
0	R	Owner Read
1	W	Owner Write
2	L	Owner Locked
3	E	Owner Execute only
4	r	Public Read
5	w	Public Write
6	e	Public Execute only
7	P	Private

Not all attributes are available on all file systems, so only those relevant to the system will be used. Instead of a string, a hex value can also be passed (using the bit value in the first column).
This will be expanded to take account of Commodore 64 and Amiga access rights.

Read an execute commands from a text file
`--cmdfile -f`
Parameters:<filename>

Reads and executes commands held in a text file <filename>. Commands will be those listed here and can include this command.

Change configuration options

`--config` or `-cf`
Parameters: <config option>|<setting>|[<extra setting>]

Changes a configuration option in the application. Allowed <config option> are:
- **trackorder**: Changes the interleave method. <setting> can be:
    - **auto**: automatic
    - **seq**: sequential
    - **int**: interleave
    - **mux**: multiplex
- **dfs**: Changes the DFS Validation options. All take <extra setting> of either True or False. <setting> can be:
    - **over**: Allow files goes over disc edge
    - **zero**: Allow zero sectors
    - **blank**: Allow blank filenames
- **inf**: Create *.inf files on download – <setting> will be True or False.
- **debug**: Write debugging information – <setting> will be True or False.
- **compress**: Compress UEF images – <setting> will be True or False.
- **scan**: Scan sub-directories on open – <setting> will be True or False.
- **open**: Open DOS Partitions on ADFS – <setting> will be True or False.

Create new directory

`--create -c`
Parameters: [<newdir>]|[<parentdir>]

Creates a new directory, <newdir>, in the currently open image as a child of <parentdir>. If <parentdir> is not specified, then the root will be used. If <newdir> is not specified, then a default name will be given (usually 'NewDir' plus a number).

Delete file or directory

`--delete -d`
Parameters:<filename>

Deletes a file/directory from inside the currently open image.

Write Debug Information

`--debug -db`
Parameters:ON or OFF

Turns the logging of debugging information on or off. This does not update the registry setting and is only for this session. To update the registry, see `--config` above.

Defragment

`--defrag -df`

Parameters:[<partition>]

This will defragment (compact) the specified partition or side. If none is specified, then partition/side 0 will be acted upon.

Set directory title
```
--dirtitle -dt
```
Parameters:<dirname>|<title>

Sets the directory title for the specified directory.

Extract files or directories
```
--extract -e
```
Parameters:<filename>[|<destination>]

Extracts file(s) specified in <filename> to the local OS path, or to the destination folder if specified. <filename> can contain wildcards:
* : one or many characters
# : any character
e.g. to extract everything from an ADFS image, both `--extract:$` and `--extract:$.*` will work. DFS will require the drive specifier, i.e. `--extract:":0.$"` or `--extract:":0.$.*"`.

Open image file
```
--insert -i
```
Parameters:<filename>

Opens image file <filename> from the host operating system. If it is not a valid image, nothing will be opened. <filename> should contain a full or relative path to the file.

Change Interleave Method
```
--interleave -in
```
Parameters:<method>

Changes the interleave method used in the currently open image. <method> can be:
1   : Sequential
2   : Interleave
3   : Multiplexed
This re-orders the image and does not update the registry setting. See `--config` above.

Keep application open
```
--keepopen -k
```
Parameters:none

Keeps the application open after parsing the command line options.

Create a new image
```
--new -n
```

Parameters:<format>

Creates a blank image file for format <format>:
<format> can be:
DFSS   : Acorn DFS single sided 80 track
DFSS40   : Acorn DFS single sided 40 track
DFSD   : Acorn DFS double sided 80 track
DFSD40   : Acorn DFS double sided 40 track
WDFSS   : Watford DFS single sided 80 track
WDFSS40   : Watford DFS single sided 40 track
WDFSD   : Watford DFS double sided 80 track
WDFSD40   : Watford DFS double sided 40 track
ADFSS   : Acorn ADFS S
ADFSM   : Acorn ADFS M
ADFSL   : Acorn ADFS L
ADFSD   : Acorn ADFS D
ADFSE   : Acorn ADFS E
ADFSE+   : Acorn ADFS E+
ADFSF   : Acorn ADFS F
ADFSF+   : Acorn ADFS F+
ADFSHDD   : Acorn ADFS hard drive image
CFS   : Acorn Cassette Filing System
AFSL2   : Acorn File Server Level 2
AFSL3   : Acorn File Server Level 3
C1541   : Commodore 1541
C1571   : Commodore 1571
C1581   : Commodore 1581
AMIGADD   : Commodore Amiga DD
AMIGAHD   : Commodore Amiga HD
AMIGAHDD   : Commodore Amiga hard drive
DOS+640   : DOS+ 640KB
DOS+800   : DOS+ 800KB
DOS360   : DOS FAT12 360KB
DOS720   : DOS FAT12 720KB
DOS1440   : DOS FAT12 1.44MB
DOS2880   : DOS FAT12 2.88MB
DOSHDD   : DOS FAT16 or FAT32 hard drive
When creating an ADFS hard drive image, an additional parameter is required. This second parameter takes the form:
<O|N><O|N|B><capacity>[M] where
<O|N> is the map
        O: Old or N: New;
<O|N|B> is the directory type
        O: Old, N: New, B: Big; and
<capacity>[M] is the capacity of the image in bytes (or MB if the M is included).

Notes: The minimum capacity is 20MB, while the largest is 1000MB (512MB for old map). The combinations of map and directory are:

OO: Old map old directory (similar to S, M and L shape floppy);

ON: Old map new directory (similar to D shape floppy);

NN: New map new directory (similar to E and F shape floppy); and

NB: New map big directory (similar to E+ and F+ shape floppy).

When creating an Acorn File Server image, a second parameter is required. This is the size in KB, or MB if it is followed by an 'M'. The minimum capacity for Level 2 is 400KB, and Level 3 is 640KB, while the maximum capacity is 512MB.

When creating an Amiga or DOS hard drive image, a second parameter is required. This is the size in KB, or MB if it is followed by an 'M'. The minimum capacity is 20MB, with the maximum being 1024MB.

Set boot option

`--opt -o`

Parameters:<opt>

Sets the boot option for the disc. <opt> can be:

0 or none: *OPT4,0

1 or load: *OPT4,1

2 or run: *OPT4,2

3 or exec: *OPT4,3

`--opt1 -o1`

Parameters:<opt>

Sets the boot option for the disc, side 1 (DFS double sided only). See above for options.

Rename file or directory

`--rename -r`

Parameters:<oldfilename>|<newfilename>

Renames <oldfilename> to <newfilename> within the currently open image. <oldfilename> should be the complete path, while <newfilename> should just be the file's new name.

Save image file

`--save -s`

Parameters:[<filename>][|<uncompress>]

Saves the currently open image file as <filename>. If <uncompress> is set to TRUE (for UEF) then the file will be saved uncompressed. If <uncompress> is specified for any other image type, then this is ignored. If <filename> is omitted, then the current file and path will be used. If this is a newly created image then the filename used will be Untitled, with the appropriate extension, and will be saved to the local folder.

This command is not entirely necessary as the image will be saved after all other commands have been run with the defaults for <filename> and <uncompress>.

Set disc title
`--title -t`
Parameters:<disc title>

Sets the title for the disc

`--title1 -t1`
Parameters:<disc title>

Sets the title for the disc, side 1 (DFS double sided only).

Inf Files

Most applications dealing with disc images, including emulators, will utilise a file known as an 'inf' file. These, unsurprisingly, have an extension of '.inf'. They are named the same as the file to which they belong, and which is to be imported into (or has been exported from) one of these applications. The idea is that files residing on a FAT32/NTFS/etc. file system will lose the information that the BBC MOS, and RISC OS, requires.

There has not been any hard and fast format regarding these, so a discussion was held on the Stardot forums to bash out an agreed format, which now follows. Please also note that this also applies to directories, as well as files.

This currently does not extend to non-Acorn formats, yet.

*.inf format

So, the format agreed is this - a single line, in a text file, containing:

`<filename> <load> <exec> <length> <access> <extra info>`

Where:

Each field separated by at least one space, but could be more.

`<filename>` is the original BBC filename. Quotes are optional, but mandatory if the filename contains spaces. This could be different to the way the file is named on the host system (and hence the inf file).

`<load>` is the file's load address in hex.

`<exec>` is the file's execution address in hex.

`<length>` is the file's length in hex.

`<access>` can be either the access letters (L for DFS, LWRElwre for ADFS), or hex number according to the OSFILE API:

Bit	Meaning
0	'R': Readable by you
1	'W': Writable by you
2	'E': Executable by you
3	'L': Not deletable by you (locked on DFS)
4	'r': Readable by others (NFS, not 8-bit ADFS)
5	'w': Writable by others (NFS, not 8-bit ADFS)
6	'e': Executable by others (NFS, not 8-bit ADFS)
7	'l': Not deletable by others (NFS, not 8-bit ADFS)

For DFS, this will be 0x08 for locked, or 0x00 for not locked.

`<extra info>` is tag value pairs, using quotes where applicable (i.e., contains spaces) for any extra information.

Filename Translation

The filename for the host filing system (e.g., Windows) should be valid for that system, with the .inf file matching.

BBC	<->	DOS/Windows/macOS
#	<->	?
.	<->	/
$	<->	<
^	<->	>
&	<->	+
@	<->	=
%	<->	;

Applicable to both files and directories.

Credits

Disc Image Manager designed and written by

Gerald J Holdsworth

RISC OS graphics designed by

Richard Hallas

Help and advice from

Jasper Renow-Clarke (ADFS new map)

Robert Sprowson (ADFS new map hard drive parameters)

David Pilling (!SparkFS format)

Jonathan Harston (ADFS and Acorn FS interleaving)

Mark Usher (Acorn FS)

Format sources

BBC Micro Advanced User Guide

BBC Master Reference Manual Part 1

RISC OS 2 Programmer's Reference Manual

RISC OS 3 Programmer's Reference Manual

MDFS.net

RISC OS Open Website

Peter Schepers (Commodore 64 formats)

Laurent Clevy (Commodore Amiga format)

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