

MasterSD

**SD Card Interface Cartridge for the
Acorn BBC Master 128**

www.ramtop-retro.uk

User Guide

Last updated 05/04/2022

1. Introduction

The MasterSD is a cartridge for the Acorn BBC Master computer, which provides the following features:

- Load and save programs to an SD memory card
- Very high compatibility, uses none of the Master's memory
- High performance; loads games and applications in a few seconds
- Works with OS switcher devices
- Easy installation, just plug in the cartridge and switch on
- Uses the popular MMFS filesystem and standard .SSD disk image files
- Filesystem ROM can be updated in software
- 16K Sideways RAM bank (officially supported on v1.6+ cartridges only)
- 3D printed protective case

The guide assumes you have read the installation instructions included with your MasterSD, the interface is installed and working, and you are familiar with using disk images. A copy of the installation instructions is available at <http://ramtop-retro.uk/mastersd.html>

2. How the Interface Works

For many home micros from the 80s adding support for removable solid-state storage is usually achieved by attaching a floppy drive emulator, like the famous GoTEK, to the floppy drive port.

This is an excellent solution for machines like the Amiga or Atari ST, because their games are hard-coded to load and save to floppy disks. A floppy emulator provides very good compatibility but they are cumbersome to use and by necessity just as slow as floppy drives.

On the BBC Master floppy emulators can be used, but are not required because games (and the OS) access disk storage indirectly, via what's called a Disk Filing System (DFS) ROM. Programs load and save by calling the DFS and generally don't know or care what actual hardware is used to store the data.

The MasterSD cartridge uses a filing system ROM called MMFS, which is compatible with the original Acorn DFS but accesses an SD card rather than a floppy disk drive. This, combined with the hardware required to drive the SD card, provides a fast, compatible and easy to use SD card storage system.

3. Using MMFS

Upon booting the Master for the first time with the MasterSD installed, you can enable the SD card interface by typing:

***MMFS**

This tells the Master to route disk accesses to MMFS, rather than the on-board DFS software.

MMFS works much like Acorn's DFS, but because a memory card can store potentially hundreds of disk images there are some additional considerations to deal with.

The most common disk image format for Acorn machines is .SSD (Single Sided Disk) format. MMFS uses this format, but rather than having many files scattered on a memory card it bundles them all into a single file called *beeb.mmb*, which is pre-prepared and copied to the memory card.

Each disk image is stored in a logical 'slot', identified by a number. The first disk image is slot 0, the second slot 1, etc.

Any given disk image can be 'inserted' – that is, made available for use – by typing the command ***DIN** followed by the slot number. So, typing:

***DIN 3**

will load the *fourth* disk image (fourth because the first slot is zero, not one). To see a list of files on the image you can type:

***CAT**

The normal **SAVE** and **LOAD** commands work with MMFS just as they do with a tape drive or floppy disk. Lots more information on MMFS commands can be found in the extensive documentation on the **MMFS Wiki** pages, linked at the end of this guide.

If your Master does not have a floppy drive fitted it is usually convenient to make MMFS the default filesystem. This can be done by typing:

***CONF. FILE 2**

if the MasterSD cartridge is in the first (front) slot, or:

***CONF. FILE 0**

If it is in the second (rear) slot. This setting is stored in the Master's battery backed memory and will persist until changed, although it will not have any effect in Model B mode, where typing ***MMFS** will still be necessary. (see section 5)

4. Compatibility & Memory

One major issue faced by SD card interfaces for the Master is compatibility.

Filesystem ROMs consume some memory to use as working storage, 2.5K in the case of MMFS. The widely used 'Dongle' type SD interfaces that connect to the User Port or Printer Port can locate their workspace in any of three areas:

- Main 32K RAM
- One of the Master's four 16K sideways RAM banks
- 'HAZEL' hidden memory

Use of any of these areas can cause issues with software compatibility. Main memory is the most compromised, as any reduction in available RAM here can cause serious problems with many software titles – particularly if the Master is running in BBC Model B mode via an OS switcher device.

Locating the filesystem workspace in a sideways RAM bank will generally permit Model B software to run without problems, but Master specific titles may require this memory and will fail to run if it is already used.

The HAZEL memory region is used only by some very recent Master-specific software, but is not available when running in Model B mode so is not compatible with OS switchers.

The MasterSD solves these issues by including dedicated memory on the cartridge that is only used by MMFS. A 16K sideways bank is added to the system, consisting of 13.5K of ROM containing the MMFS filesystem and 2.5K of RAM for use as workspace storage. The additional memory enables the MasterSD to function without consuming any system RAM, in both Master and BBC Model B modes. Also, MasterSD cartridges with an HDL revision of 1.6 or higher add a 16K sideways RAM bank that is available for user purposes; the HDL revision is listed on the sticker on the anti-static bag provided with the cartridge.

Some Master specific titles may encounter issues when both the MMFS and DFS ROMs are enabled at the same time. DFS can be disabled by typing:

***UNPLUG 9**

And re-enabled by typing:

***INSERT 9**

This setting is persistent.

5. OS Switcher Devices & BBC Model B Mode

In its default configuration the BBC Master is only semi-compatible with games written for the 32K BBC Model B. This is due almost entirely to the updated operating system ROM used on the Master, which contains significant changes compared to the Model B.

To solve this issue many Master owners fit a device known as an 'OS Switcher'. These provide the capability to switch between the Master OS ROMs and Model B OS ROMs, generally by means of a physical switch.

The MasterSD is fully compatible with OS switchers and will work without problems in Model B mode. However, if the OS switcher includes a Model B DFS ROM then the Master will default to the floppy drive as current storage device – even if a floppy drive is not fitted. To enable the MasterSD in Model B mode it is necessary to give the command ***MMFS**

Unlike normal Master mode, the Model B ROMs do not support battery-backed ('CMOS') memory so this setting cannot be made to stick between power cycles.

In addition, the usual SHIFT-BREAK keypress to boot from a disk will not work as this causes a reboot and the computer will default back to booting from floppy.

There are multiple ways to boot from the SD card in Model B mode.

Firstly, issuing the ***MMFS** command and then pressing SHIFT-M-BREAK will boot from the SD card.

Also, after using ***MMFS** the command ***DBOOT 0** will boot from a specified disk image on the SD card (where 0 is the slot number of the image you wish to boot from).

Finally, it is possible to boot from the SD card by pressing CTRL-M-BREAK to reboot the computer with MMFS active, and then pressing SHIFT-M-BREAK to boot from the card.

A small number of games may encounter problems when both MMFS and DFS ROMs are present at the same time. Unlike in normal Master operation, there is no way to permanently disable the DFS ROM when in Model B mode. However, typing :

?&DFE=&FF

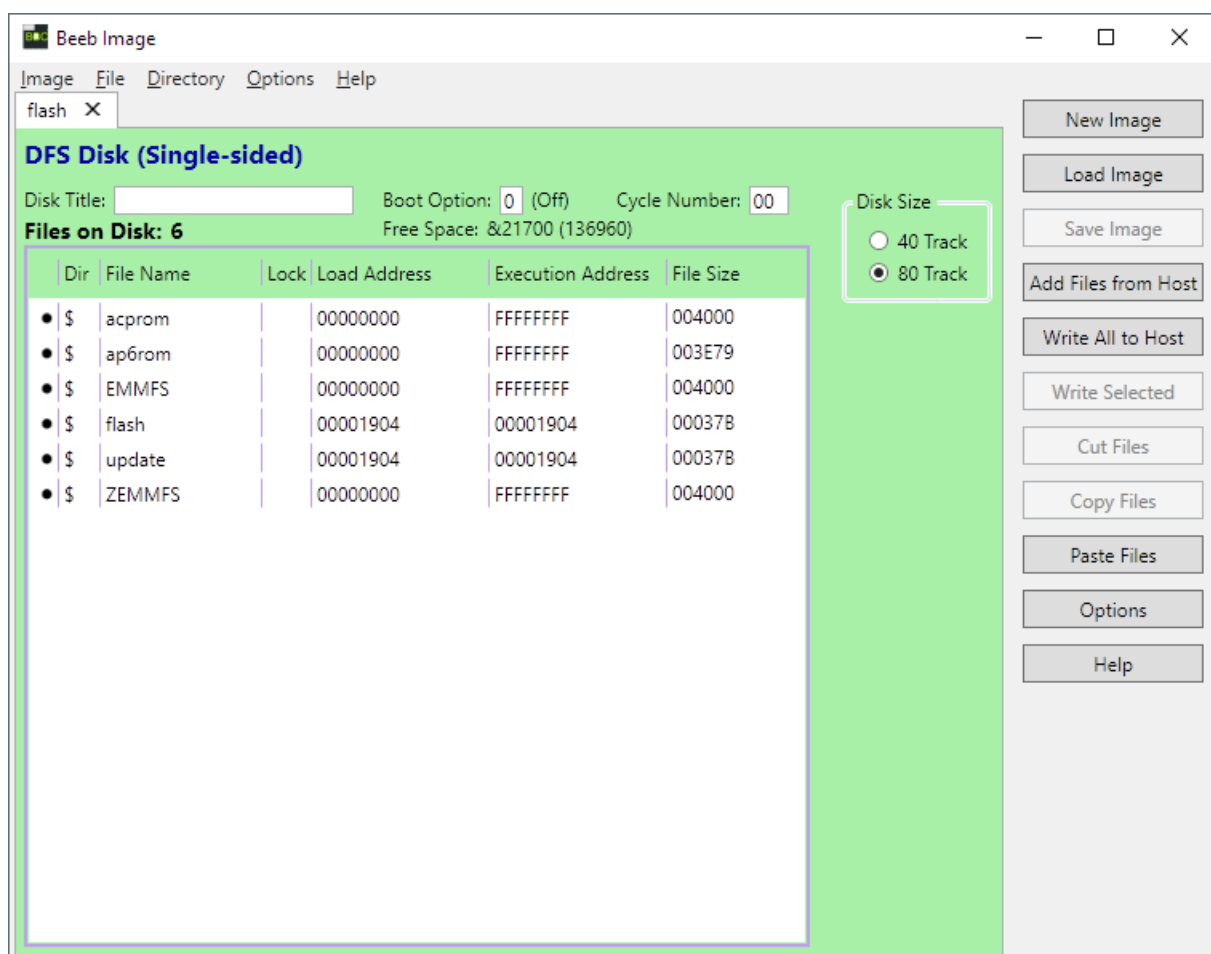
And pressing BREAK will temporarily disable the DFS ROM until the computer is power cycled.

6. Adding files to a .SSD Disk Image

To add your own files to an existing disk image, a program called Beeb Image is used. You can download a copy here:

<http://www.cowsarenotpurple.co.uk/beeb-image.html>

Open Beeb Image and click 'Load Image' to select the SSD file. Then click 'Add files from host' and select the files you wish to add. Finally, click the image menu and 'Save Image' to save the modified SSD.



7. Adding SSD images to a beeb.mmb file

To create your own beeb.mmb file or to add .SSD files to an existing one you will need to download the MMBImager software from

<https://github.com/dandelion-labs/MMBImager>

If you are creating a new beeb.mmb file, click **'File'** then **'New Image'**, and select the root directory of your SD card as the destination. When prompted enter **'beeb'** as the filename.

To use a pre-existing beeb.mmb, select **'File'** then **'Open Image'** and choose the beeb.mmb file you would like to use.

Adding an SSD image can be done by dragging the file from the Windows file manager to a slot in the MMB Imager window. On older MMB Imager versions you should select a disk image slot in the main window and click **'SSD Image'** then **'Load Image'** to insert an SSD image in to that slot.

When you have loaded all images, click **'File'** then **'Close Image'**.

Note: on some PCs MMBImager may not run due to an error that references the **'MSCOMCTL.OCX'** file. To fix this problem follow the steps below:

- Download the archive containing MSCOMCTL.OCX from Microsoft by clicking here : <https://www.microsoft.com/en-us/download/details.aspx?id=10019>
- Run the installer you just downloaded
- If you have a 64-bit Windows system, open a command prompt (CMD.EXE) and type: **copy c:\windows\system32\mscomctl.ocx c:\windows\syswow64**
- If you have a 32-bit Windows system, open a command prompt (CMD.EXE) and type: **copy c:\windows\system32\mscomctl.ocx c:\windows\syswow32**
- Then finally, type : **regsvr32 mscomctl.ocx**
- Reboot the PC

8. MMFS Command Reference

See <https://github.com/hoglet67/MMFS/wiki/Command-Reference>

9. Acknowledgements

The MasterSD uses the MMFS software, originally developed by Martin Mather and maintained by David Banks. Many thanks to these gentlemen, without their work this device would not have been possible.