

The Macintosh Filing System



Formatting 800K MFS Disks With 64K ROMs

800K Drives

Larry Pina mentions in his book "Macintosh Repair & Upgrade Secrets" (©1990 Hayden Books) on page 192 that a 128K with an 800K internal drive works just fine on a Macintosh 128K, giving you 800K of MFS storage. However, he gives few details, leaving the reader to infer that there's little else to it.

Compatible Drives

■ Internal 800K Drives

As Pina indicates, both the Macintosh 128K and 512K will boot from an internal 800K drive as long as it is Apple part number 661-0345 (Sony p/n MFD-51W-03), no other earlier 800K drive mechanism will work (though possibly some later models). These drives will also startup from, read and write 800K MFS only disks.

■ External 800K Drives

The Apple 3.5" Drive (Apple p/n A9M0106) which contains the aforementioned drive mechanism, will also boot, read and write 800K MFS. However, the original Apple 800K External Drive (Apple p/n M0131) will not work without the HD20 INIT and then only to read and write preformatted 800K MFS disks as well as HFS) and you cannot boot from this drive with 64K ROMs.

Formatting Disks

1

Formatting With 128K ROMs

What Pina does not go into, is how exactly you get 800K MFS disks from which to read/write and boot on a stock 128K & 512K.

One method that has been posted around the net, requires a Mac Plus or 128K ROMs. Basically you boot up with System 2.0/Finder 4.1 (the last MFS only System & Finder and pre-HFS aware) on a Mac Plus or 512Ke, possibly even a "128Ke" (128K ROMs in a 128K Mac – which Larry Pina says will work but I've not tested) and insert a blank 800K disk. If it is unformatted the Mac will ask you if you want to initialize and about :30 later, you'll have an 800K MFS disk. Even if the disk is formatted, Erase will accomplish the same thing. The resulting disk will work just fine in a stock 128K and 512K using one of the appropriate 800K drives.

2

Formatting With 64K ROMs

The HD20 INIT was released with System 2.1/Finder 5.0 (an HFS aware System & Finder) along with the HD20 Hard Drive. The HD20 INIT was necessary for use on the 512K to patch the ROM and tell it about HFS and 800K floppy disks, but the 128K could not use it. The Mac Plus with 800K drives quickly followed with 3.0/5.1 and a larger ROM that contained the same information as the HD20 INIT and that was quickly followed by a succession of updates resulting in what is the widely accepted stable system 3.2/5.3 which Pina and others reference for use with the HD20 & 800K drives. The reason the 2.0/4.1 formatting trick works on the Plus & 512Ke is that the System & Finder don't know about HFS, but the ROM translates the 800K driver info for it and then the Finder acknowledges 800K capacity, but it still only understands MFS. Once the disk is formatted with the disk capacity information, the Finder no longer needs the ROM to translate and any Finder will happily see the disk as 800K MFS.

Normally the HD20 INITs purpose is to load HFS information into a system with 64K ROMs, but not when you put a copy of v1.1 of the HD20 INIT on System 2.0/4.1 updated with AppleTalk ImageWriter v2.3 installation disk. When the system boots instead of "Hard Disk 20 Startup", it will say "Disassembler Installed". Once loaded you will have an MFS ONLY AWARE environment, but the HD20 INIT evidently tells the Mac all about any 800K disk attached to it.

This not only works with the recommended drives but also the original 800K External Drive (M0131) and any 800K drive mechanism (but you will

not be able to boot from any but the recommended drives, just like with an HD20 Hard Drive).

■ Creating The System Disk

First you need to construct the proper system disk that will work with the HD20, but only write MFS. This is a matter of using common Apple Macintosh System disks and Update disks.*

1. Start with a clean copy of System 1.1/Finder 1.1g (you may be able to skip this step).
2. Using System 2.0/4.1 Update disk, Install the upgrades to your 1.1/Finder 1.1g disk (alternately you may be able to simply start with a clean copy of System 2.0/Finder 4.1).
3. Using the Printer Installation disk (v1.1) that came with System 3.2/Finder 5.3 update (also known as System Installation v1.0), Perform a custom install of just the AppleTalk Image Writer (v2.3) onto your clean 2.0/4.1 disk. You must use the installer as the System must be modified to use AppleTalk. Dragging an AT ImageWriter driver to the System Folder won't do it.
4. Add a copy of the HD20 INIT to your System Folder.

Now you're ready to startup your Mac from this disk.

Then, just pop a blank 800K disk into any 800K drive and choose Initialize from the dialogue box and you'll have a newly formatted 800K MFS disk.

The HD20 INIT will still not load on the 128K Mac. In order to create new 800K MFS formatted disks on a 128K you will need to basically make disk copies with a third party disk utility of a previously formatted blank disk created with one of the above methods. The following steps detail the method using Copy II 7.0 (but other disk copy utilities may work as well).

1. Take the blank 800K MFS formatted disk, write protect it and keep it as a master to duplicate more (you might want more than one if you don't have access to one of the above Macs)
2. Using any boot system, Launch Copy II 7.0 and select "Sector Copy no Format". This is very important as formatting the disk will make it unusable. "Bit Copy" also works but is much slower.

3. Set your “Original Drive“ and “Duplicate Drive”. Unless you have an 800K internal drive as well as an external drive, these will be the same: your 800K drive.
- 4, Click Start, follow the instructions and it will make a perfectly usable and bootable MFS 800K blank disk copy from an unformatted disk out of the box .

■ Macintosh Initialization Package

If the disk copy utility formats the disk, it may not work and you'll see the same crashes as trying to format with the Mac's initialization package without the HD20 INIT installed.

Once the disk is formatted with 800K you can erase it all you want.

The disk retains the 800K formatting instructions, in much the same way as the SCSI ZIP 100 drive retains the 4.2 driver after formatting under System 6.0.4+ and can then boot from System .97/Finder 1.0 up, regardless of how many times it is erased with the Finder.

■ Internal 800K Drives

If you install an approved 800K drive internally, replacing your stock 400K drive, you may experience a continuous spinning disk and/or ejection upon power-up following installation. This is caused because the drive requires a different internal ribbon cable than used by the 400K drive. Typically, the 400K drive uses a red-striped ribbon cable. The bootable 800K drive uses a special yellow-striped ribbon cable. To add to the confusion, other 800K drives use the red-striped cable. Make sure you have the yellow one. If you don't, you can cut wire 20 to essentially convert a red-striped cable to a yellow. To do this, locate the outside wire opposite the red-striped one and clip a small section out of it so it does not accidentally connect again. You may need to cut wire 9 as well if the problem persists. In which case, starting with the red-striped wire on the right (as one), count left to the 9th wire. Be very certain you have the correct one. Carefully cut a small section out of it as before.

■ Mixing 400K & 800K Drives

Common Problems

1

**400K
Internal w/
800K Ext.**

While it's true you may use any combination of 400K & 800K internal and external drives together, different combinations and systems produce different results.

This is the optimal configuration on any 64K ROM system giving you 1.2MB total simultaneous storage. Using the methods in this tutorial your system should work normally either in 800K MFS mode or using the HD20 on a 512K. It is certainly the easiest to configure. If you do not yet have an external drive for your system, the Apple 3.5 Drive is the way to go.

By default all 400K drives format in MFS only. But, to keep your 800K disks organized, you should note very carefully whether they have been formatted in 400K or 800K, HFS, or MFS. The reason being if you insert an 800K formatted disk into your 400K drive, it may not be recognized as a double-sided drive and ask you to initialize it, likewise with an 800K HFS formatted disk in the 800K drive while you are running an MFS only system which cannot read HFS. You could accidentally erase your disk in this manner.

If you intend to primarily use 800K disks as a single drive system and only occasionally use the 400K external drive this system may be acceptable for you. However, both this configuration and the following suffer from a problem called "pulsing" when using systems without the HD20 INIT. Which means always with the 128K. Basically, pulsing is a regular disk noise that continues except during disk access, as long as an external drive is connected. If you use the HD20 INIT on the 512K, the pulsing begins from the time you power up the Mac until the system is loaded, but then operates normally. Since the 128K can't use the HD20 INIT, you must endure the pulsing as long as an external drive is attached. This is NOT the same problem caused by the incorrect internal ribbon cable and as far as I know cannot be corrected in the hardware, it is a software only fix.

Do not connect or disconnect drives without turning the power off.

■ **MFS HD20 INIT And HFS Disk Warning**

An even greater incentive to keep your disks carefully organized is this: When using an MFS system like System 2.0/Finder 4.1 with the HD20 INIT, while the system only understands MFS, it can now actually read HFS

2

**800K
Internal w/
400K Ext.**

3

800K Internal w/ 800K Ext.

*Advanced System Options

disks. If you insert an HFS disk under this configuration, you won't realize it since the system does not know how to tell the difference (the usual additional pixels do not appear in the disk window) and you risk corrupting your disk by writing to it. Normally an MFS only system would simply not recognize the disk and ask if you want to initialize it. I would suggest only using this system configuration for formatting disks and nothing else. However, if you want to stop the pulsing in an MFS environment with external drives you have no choice. Therefore you must be very careful not to mix up your disks between system environments.

Once again, if you intend to primarily use 800K disks as a single drive system and only occasionally use the 800K external drive this system may be acceptable for you. However, this configuration as well suffers from a problem called "pulsing" when using systems without the HD20 INIT. Which means always with the 128K. If you use the HD20 INIT on the 512K, the pulsing begins from the time you power up the Mac until the system is loaded, but then operates normally. Since the 128K can't use the HD20 INIT, you must endure the pulsing as long as an external drive is attached. This is NOT the same problem caused by the incorrect internal ribbon cable and as far as I know cannot be corrected in the hardware, it is a software only fix. Nevertheless, the obvious advantage here for using the HD20 INIT is the ability to access 1.6MB of storage on your 512K, just like a Mac Plus as well as use it with MFS. In the later case, just make sure you heed the warnings. As for the 128K, while you are limited to a single disk drive to avoid the pulsing, you have lost none of the storage you had with an external drive and gained an additional 400K of contiguous storage which can be invaluable for big files or keeping a project and application all together on one disk.

■ Creating a System Disk With Advanced Options

The procedure documented above for creating a system disk that will format 800K MFS disks on 64K ROM Macs works reliably and doesn't require anything but basic Macintosh disks commonly distributed by Apple. The following method is a little more complicated, but results in a smaller system file and heap (the area in RAM occupied by the system).

Start with a copy of System 2.1 and Finder 4.1. System 2.1 can be found on the original Hard Disk 20 Startup disk released in September 1985.



ResEdit HD20 INIT

Combine these two files on a disk together with a MODIFIED copy of the HD20 INIT as follows:

1. Open the HD20 INIT with ResEdit. You will see a resource labeled PTCH. Open this resource and you should see three resources named “TFS” (for Turbo File System aka HFS), “.Sony” and “Dispatch Kernel”.
2. Delete all resources but “.Sony”
3. Save the modified file.

Basically this trims down the HD20 INIT from 32K to a mere 8K. It also prevents the HFS code from loading into the RAM system heap (which you don't want anyway), thus keeping more RAM available for applications. Without the HFS code, the system no longer reads HFS disks and you avoid accidentally writing to them under MFS. However, be sure to keep your HFS disks clearly labeled as this system will ask you to initialize a disk it doesn't understand and you could just as easily erase your data if you don't.

There is another size advantage to this system: there is a mere 3K difference between System 2.0 & 2.1, while the AT ImageWriter updated System 2.0 loads substantial resources unnecessarily increasing the system size and heap. While this system is a bit more complicated to create, it is a much leaner system for use on a somewhat RAM challenged Macintosh. Also, System 2.1 is so similar to 2.0 that it should be a much more stable and reliable system for day-to-day use.

So what is happening here? I suspect that when Apple rushed the HD 20 to market (5 months after they announced it!), they slapped a small patch on the current System 2.0 to load the HD20 INIT into RAM, which contained all the HFS system info as well as the new disk driver info. The real and necessary improvement was Finder 5.0 which was able to catalogue the new data structure as well as write it. By eliminating the HFS aware Finder and cutting the HFS info out of the HD20 INIT, we are left with a system that knows how to load the HD20 INIT, which now only loads the new driver data. The new driver data enables the MFS only Finder to now format the previously unknown disk size. This system may also be able to format an actual Hard Disk 20 completely under MFS as well.