NOTE: This Technical Note has been retired. Please see the Technical Notes page for current documentation.

Technical Note FL21

Hard Disk Medic & Booting Camp

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The death of a hard disk with megabytes worth of data can be disappointing. This technical note will describe techniques for recovering a hard disk and the data that is on it. The discussion will also include some tips on how to avoid problems.

[Jul 01 1987]

Introduction

You should never need this information. However, software problems can wreak havoc upon otherwise functional disks. When they have the equivalent of a heart attack, there are a number of steps that can be taken to try to recover the disk. There are occasions when the disk itself is not bad, and it may be possible to correct the disk without having to reformat the disk and restore the data from a backup. This note will describe some of the steps that can be used with Apple Hard Disks, but most of the information pertains to all hard disks. For example, the HD SC Setup program is specific to the Apple drives, but there is probably a similar utility for every hard disk. This is primarily a discussion of what to do from the user standpoint, but there are a few suggestions on ways of retrieving data via programmatic means.

This discussion will focus on the SCSI disks since they are more complex in terms of the booting sequence. For other hard disks, like the standard HD-20, most of the information still applies, but SCSI-specific sequences can be ignored. For example, the standard HD-20 also has an installer program, although it is different than HD SC Setup.

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Attack of the Nasties

There are a number of unusual conditions that a hard disk may get itself in:

1) The data is intact, but the hard disk won't boot.

2) The SCSI disk won't boot and only shows up after running HD SC Setup.

3) The disk will boot but hangs part way through the boot process.

4) There are data errors while the disk is running.

5) The disk is very slow returning to the Finder.

6) The computer crashes or hangs when returning to the Finder.

7) The disk appears in a "This disk is bad" dialog.

8) The disk never shows up at all.

These problems can develop from a number of sources, including system crashes, rebooting at bad times, power fluctuations, malicious software, old software, buggy software, etc. In general, these problems will be software-related, since the hardware itself is very rarely defective.

This technical note will discuss:

1) The normal stages in the booting process.

2) Results of errors during the various stages in the booting process.

3) A step-by-step procedure to follow in order to maximize your chances of recovering the disk and the data.

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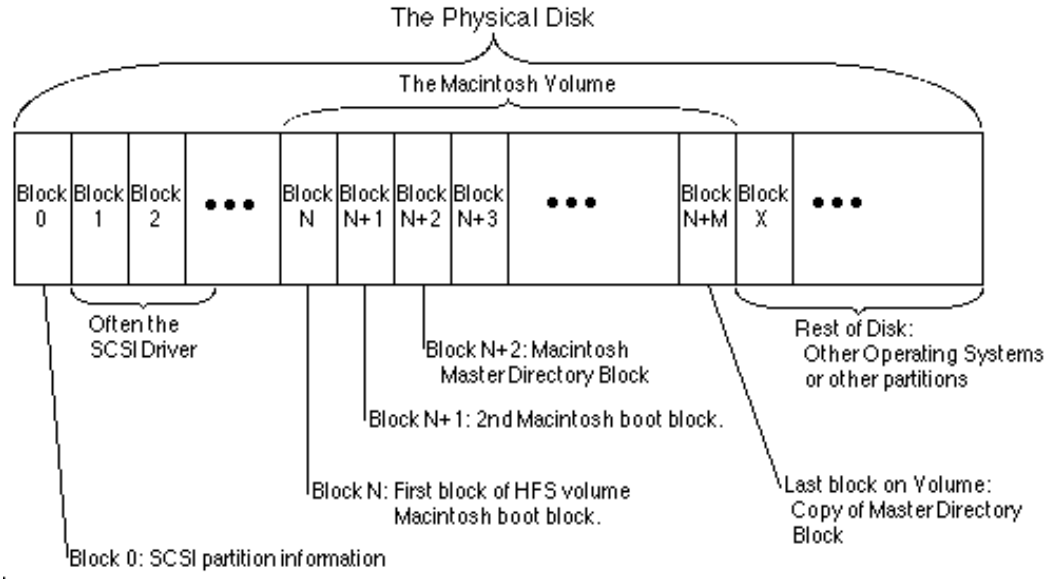
A Boot to the Head

This discussion will detail a normal boot process of a Macintosh with a single hard disk attached. For clarity, this section will deliberately ignore potential problems and the complexities involved in different configurations. The following sections will detail some errors that may occur, and give more information in terms of what the ROM will do to boot the system. A SCSI disk can be thought of in the following fashion:



The important thing to note from this diagram is that the Macintosh volume is a subset of the entire SCSI Disk. There can be more than one Macintosh volume on a given disk, or even other volumes that are not Macintosh volumes.

1) Check the SCSI port:

Immediately after the RAM check, the system looks at the SCSI port to see if there are any drives connected. If a SCSI drive is found the system reads the SCSI partition information in block 0. This block is specific to SCSI drives and is always found at block 0 of the disk. The SCSI Manager then reads in the SCSI driver from the disk. Once the driver is loaded into memory, the system will use the driver to read and write blocks from the disk, instead of the ROM boot code. The driver reads and writes blocks relative to the beginning of the Macintosh volume on the SCSI drive, which can start anywhere on the physical disk.

2) Decide which disk is to be the startup disk:

The Macintosh then looks at the floppy disks to see if there is a disk that it should try to use. If so, it will always boot from the floppy. If there are no floppy disks, the startup hard disk is chosen. The Macintosh boot blocks are read off of the chosen disk to determine if the volume is bootable. The two Macintosh boot blocks (same boot blocks as those found on floppies) are read using the SCSI Driver. The Macintosh boot blocks are found as the first two blocks on the Macintosh **volume**, but are much higher in terms of where they are found on the **disk** itself. See the figure for the difference between the Macintosh volume and the SCSI disk. The driver cannot normally read the SCSI partition information, or any blocks outside of the Macintosh volume.

3) Execute the Macintosh boot blocks:

The boot blocks are composed of strings and parameters which determine various system functions, and code that finishes the job of booting the system.

The hard disk is mounted as a volume, using the PBMountVol call. The volume has the two Macintosh boot blocks, as well as the volume header. The PBMountVol will use the driver to read the volume header and other information from the disk. Once the volume is mounted, there are only volume reads and writes, and the driver is responsible for the actual SCSI disk reads.

The System file is opened on the volume. The patch code for the current ROM is read into the system, including the patches to the SCSI Manager.

The Finder is launched.

4) The Finder uses the Desktop file on the volume to draw the desktop.

The Icons that make up the desktop representation of the Macintosh volume are stored in the Desktop file. The Desktop file is invisible and used only by the Finder.

That is a rather simplistic view of the boot process. There are a number of complications that arise due to the wild variety of devices that can be attached to a Macintosh. The full boot process is essentially a series of special cases, leading to the final booted System at the Finder's desktop (or in the startup application). The following section will go into painstaking detail in order to give you enough information to determine what step in the boot process failed.

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Tough Boots

To further explain the boot process:

1) Check the SCSI port:

a. Before starting the boot process, the screen will be filled with a grey pattern.

b. Before the Macintosh will check for any SCSI devices, it will first reset the SCSI bus using a SCSIReset. This is to make sure the bus was not left in a bad state.

c. The Macintosh will then start a cycle through all 7 SCSI IDs (from 6..0) to see which disks are connected, and keeps a table of all disks that are connected.

d. For each disk that is connected to the Macintosh, the ROM boot code will use the SCSI Manager to read in the SCSI partition information to find where the driver is located on the disk. The signature of the SCSI partition information is also checked to be sure that the device is valid.

e. The SCSI Manager will then be used to read the driver into memory. Once the driver is loaded for a given disk, the driver is called to install itself. The driver will usually post a Disk Inserted event to have its volume mounted by the Finder.

f. Steps d and e are repeated for each disk connected. At this point, there may be a number of drivers in memory, but there are no volumes, since none have been mounted yet. Generally there is one driver per disk, but some drivers can handle more than one disk at a time.

2) Decide which disk is to be the startup disk:

a. The next stage is to determine which volume will become the startup disk. If there is a floppy available it will always be the startup disk. During this process the disk chosen as the startup disk is not known to be valid. The System file and boot blocks are checked later.

b. The standard HD-20 is connected to the system in a fashion that is very similar to a floppy, so if a bootable HD-20 is connected it will be the startup disk.

c. There is no search for floppy devices like there is for SCSI disks since the driver for the floppies will post a Disk Inserted event when it detects a floppy in the drive. The first floppy device that is found will be used as the startup disk. If there are multiple floppy devices, the others will be mounted by the Finder, not at boot time. The SCSI devices that are online are not mounted at this time, either. There is a pending Disk Inserted event for each disk that will be handled by the Finder.

d. At boot time, there is only one volume that is mounted (during execution of the Macintosh boot blocks). The others will be mounted when their Disk Inserted event is processed at a GetNextEvent call.

e. On the new Control Panel there is a Control Device (cdev) called the Startup Device. This Startup Device cdev allows the user to choose which device the system should try to boot from first. This can only be used on the

Macintosh II and SE. The drive number, driver reference number, and driver OS type are stored in parameter RAM to allow a chosen device to be the boot disk. The floppy drives will still have precedence over the SCSI devices. The standard HD-20 can be chosen as the Startup Device as well, since it uses a different driver reference number. If the drive number that is stored as the Startup Device is invalid, or had a read/write error, then another disk in the chain will be chosen as the next bootable candidate. Remember that there is only one boot/startup/system disk, and it is the only one that is explicitly mounted at boot time. All other devices in the system will be handled once the system is booted.

3) Execute the Macintosh boot blocks:

a. Once the Startup Disk has been chosen (whether floppy, SCSI or other disk) then it is time to read the Macintosh boot blocks off of blocks 0 and 1 of the volume. Those boot blocks determine various parameters in the system, such as whether a Macsbug-like debugger will be loaded, the name of the startup program (not always the Finder), how big to make the event queue, how big to make the system heap, and so on. They also contain a signature identifying them as Macintosh boot blocks, and a version number to differentiate between different boot blocks.

b. After the boot blocks are read and the signature verified, the smiling Macintosh is displayed on the screen. The smiling Macintosh basically means that valid Macintosh boot blocks were found.

c. On 64K ROMs the boot blocks are executed by jumping to the code that follows the header information in boot block 0. On the newer Macintoshes the boot block version number is checked, and if it is `old' the boot blocks will be skipped. The same code that would have been found in the boot blocks is found in the ROM itself. Regardless of which kind of Macintosh it is, the following steps apply. For the newer Macintoshes the boot blocks are usually used only for the parameters stored in the header.

d. Do the `PBMountVol` on the chosen startup volume. If `PBMountVol` fails, the process starts over at the point where a startup disk is being chosen (step 2 above). The failing volume is marked out of the list of candidates so that it won't be used again.

e. Find the System file and create a Working Directory, if needed, for the System folder. This is only done for HFS volumes of course, and the directory ID is set to the blessed folder. The blessed folder is saved in the volume header as part of the `FinderInfo` field. See Technical Note #67 for more information on the blessed folder. If the directory ID is wrong, the System file won't be found, causing it to start over again (at step 2 above). If the Working Directory was created successfully, that `WDRefNum` is set as the default volume with `SetVol`.

f. The System file is opened with `OpenResFile`. If the file could not be opened, the process starts over again at the point where a suitable boot device is being chosen (step 2 again).

g. The Startup Screen is loaded and displayed. If there was no Startup Screen, the normal "Welcome to Macintosh" message will be displayed. The Startup Screen or "Welcome..." means that the System file was found and opened successfully. On the Macintosh Plus and 64K ROM machines, the Startup Screen is displayed before the System file is opened. (reverse steps f and g)

h. The debugger and disassembler are installed if found. The names of the debugger and disassembler are found in the header of the boot blocks and are usually Macsbug and Disassembler respectively.

i. The **data** fork of the System file is opened and executed. The data fork contains code to read in the PTCH resources which patch the ROM.

j. The INITs that are in the System file are executed. The last INIT is INIT 31 which then looks in the System Folder for other INITs to be executed.

k. The file specified by the boot blocks as the startup application (Set Startup at the Finder) is found on the volume, using another field in the `FinderInfo` field of the volume header in order to get the Directory ID. If the file exists, it is launched. If not, the Finder is launched. If the Finder is not found, `SysError` is called with error code of 41 which is the "Can't launch Finder" alert.

4) The Finder uses the Desktop file on the volume to draw the desktop.

If the startup application was the Finder, it opens the Desktop file on the startup volume in order to draw the desktop. When it finishes with the startup volume, it calls `GetNextEvent`. If there are any pending Disk Inserted events, the volume specified is mounted (by the ROM) and the result passed to the Finder. If `PBMountVol` failed for any reason, the bad result will be passed to the Finder. At that point the Finder would put up the "This disk is damaged" alert and ask if the volume should be initialized or ejected. If ejected, the driver for that volume still exists, but the volume is unmounted. For each volume that the Finder sees, it opens the Desktop file on the volume to get the information that it needs to build the desktop. If the Desktop file was not found on a volume, it is created. If there are any errors while creating or using the Desktop file, the Finder will display the "This disk needs minor repairs" message. If the OK button is clicked, the Finder will delete the old file and create a new one. If that fails, the volume is unmounted and deemed unusable by the Finder. This happens if the disk is locked, or too full to add a Desktop file. If that was the startup volume, the computer is rebooted since it was forced to unmount the startup volume, and cannot run if there is no startup volume.

If you follow the previous sequence closely, you can predict what errors are causing a given end result. For example, if you have the effect where the smiley Macintosh appears, but immediately goes away and the disk does not boot, you can look through the sequence to see what might be going wrong. In this case, we know that the boot blocks were found on our startup volume, since the smiley Macintosh was displayed. We know that the System file was not found, or failed to open, since we never got the Welcome message. This usually calls for throwing away all of the System Folders on the volume, and starting again with a new System Folder to fix the problem. If there is more than one System Folder on a volume it is possible to confuse the system.

Other tidbits of information that may be useful (in no particular order) some which will be mentioned in the step-by-step operation below:

1. The SCSI cables have a lot of wires in them, and are rather bulky because of it. It is best to avoid bending the cables too much or too often, since the wires inside will break if overstressed. Don't put wild kinks in the cable in order to make it fit behind the Macintosh.

2. If there is no default volume stored in the parameter RAM with the Startup Device cdev, then the first drive that is in the drive queue will be the Startup Device. Since SCSI drives are added in highest ID order, that means the larger SCSI IDs will have a higher `priority'. Macintosh IIs will default to the internal hard disk.

3. If the parameter RAM is trashed for some reason, the boot process can fail since a driver OS type is stored as well. If the OS type is wrong, the ROM will skip that driver, making the disk unbootable. On the Macintosh II/SE, the battery is no longer removable to fix parameter RAM problems. To correct this problem the Control Panel now has a feature that will allow you to clear parameter RAM. Holding down the Option-Command-Shift keys while opening the Control Panel will reset parameter RAM, forcing it to be rebuilt and therefore losing all of your settings, but possibly fixing some booting problems.

4. The Macintosh II and SE both have a new feature that will allow you to skip having the any hard disk mounted. Holding down the Option-Command-Shift-Delete combination will have the startup code skip the SCSI hard disks on the system. This can be useful if you are booting an old System file that does not understand HFS disks (like System 2.0/Finder 4.1), and want to avoid having your hard disks on line while you do something shaky. With external hard disks it is easier to just turn them off, but with internal disks it is not so easy.

5. Since the parameter RAM can be trashed in a manner that makes it impossible to boot a volume (looking for the wrong OS type), a new feature was added to the HD SC Setup program to have it fix this problem as well. If you have version 1.3 or greater, the parameter RAM bytes that determine booting will be reset to fix some boot problems that occur. The parameter RAM is fixed when the Update button is clicked. This does not invalidate the rest of parameter RAM, it merely fixes the bytes used for the Startup Device.

6. When the Finder copies a new System Folder onto a disk that does not already have a System Folder, that new folder will become the blessed folder. Its Directory ID will be saved in the volume header. In addition, the Macintosh boot blocks will be copied from the current startup device to the destination device. This is the best way to fix System Folder or Macintosh boot block problems. In order for the blessed folder to be set correctly, all System Folders on the volume should be deleted before copying the new folder there.

7. If the Desktop file is damaged for whatever reason, it can be deleted with a number of programs. This will force the Finder to rebuild it from scratch. You can also have the Finder rebuild the Desktop file by holding down the Option-Command keys when the Finder is launched. When the Desktop file is rebuilt you lose the Finder Comments in the Get Info boxes.

8. On the 64K ROMs, whenever something goes wrong during booting (like System file not found, bad boot blocks, and so on) the Sad Mac Icon is displayed. Starting with the 128K ROMs, whenever something goes wrong the ROM jumps back to the start to try to find another disk to use.

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Bo3b's Boot Repair

This section will detail step-by-step processes that can be used to fix some common booting and volume problems. It is not intended to cover every possible case. The purpose of the preceding sections was to give you the information that will allow you to figure out what might be going wrong.

For most hard disk users, it is not sufficient to merely have the device running. It is generally a good idea to make the system as robust as possible in order to avoid some of the problems that might cause a volume to become wholly unreadable. The ultimate fix is to reinitialize the volume from scratch and rebuild the volume with the Finder or a restore operation that uses the File Manager. This is guaranteed to fix anything except hardware problems, and will give you the most solid system. If your system is acting funny, you can try the following sequence that is the next best thing to initializing the disk. This sequence will not make you rebuild the disk, but can be fooled by some disk problems. If everything passes, then the disk is in good shape; maybe not perfect, but good.

1. Power down the entire system, including the hard disk that is suspect.

2. Run the HD SC Setup program (or equivalent) and Update the drivers on the disk. For HD SC, this also fixes the parameter RAM. For non-Apple drives, the parameter RAM can be reset with the Control Panel.

3. Run the Test Disk option in HD SC Setup (or equivalent). If the test fails, reinitialize the volume, since it is not worth risking future problems.

4. Run the Disk First Aid utility. This utility will work on all HFS volumes. Have it check the volume for consistency. If it reports any errors, you can have it fix the problem, but the tack is to reinitialize. There are some problems that Disk First Aid won't catch. If Disk First Aid says the volume cannot be verified, it is time to reinitialize.

5. Rebuild the Desktop file by holding down Option-Command when returning to the Finder.

If you can successfully perform all of these steps, the volume will be as solid as it can get without reinitializing the disk. If things are still funny, it is time to take the last recourse, reinitialize.

Based on the previous sections, it is now time to go through all of the Nasties to give a step-by-step sequence for fixing these problems.

1) The data is intact, but the hard disk won't boot.

This is for the case where the volume won't boot, but if the computer is booted with a floppy disk the volume shows up at the desktop and can run normally. For this case, we know that the driver is being loaded and working, since the volume shows up at the desktop. The volume is also mountable, since it shows up with no problem. This implies that the Macintosh boot blocks are wrong, or the blessed folder is wrong. Clues such as the smiling Macintosh can tell you how far the process got before it failed. For example, if the smiling Macintosh never appeared, we know that Macintosh boot blocks were not read successfully. When the volume is fixed and bootable, it would be a good idea to go through the steps above to make the volume as solid as possible.

The sequence to follow:

a. Power down the entire computer, including the hard disk. Try to boot again. If it works, you are done.

b. Use the Control Panel's Startup Device to set the hard disk as the Startup Device. This will also reset some of the bytes in parameter RAM. Try rebooting to see if it has fixed the problem.

c. Run HD SC Setup (or equivalent) and perform the Update Drivers procedure. In the HD SC Setup case this will also rewrite the parameter RAM. If you are not using HD SC Setup, blast the parameter RAM with the Control Panel. Try rebooting.

d. Delete **all** System Folders from the hard disk. Using Find File or something similar, be sure that there are no stray copies of the System or Finder buried in some long lost folder. Copy a new System Folder to the volume, using the Finder. This process will fix bad boot blocks, as well as a bad blessed folder. Try rebooting.

e. If it still won't boot, there is something very strange happening. Whenever things get too weird it is usually time to start over: reinitialize.

2) The disk won't boot and only shows up after running HD SC Setup.

The disk does not even show up at the Finder when the system is booted with a floppy. After running the HD SC Setup (or equivalent) the volume will appear on the desktop and be usable. The HD SC Setup and most similar utilities will do an explicit `PBMountVol` of the volume in order to make the volume usable. Since the volume does not show up at the Finder at first, this implies that the driver itself is not getting loaded or is working improperly, since there was no Disk Inserted Event for the Finder to use.

The sequence:

a. Power down completely, including the hard disk.
b. Run HD SC Setup (or equivalent) and Update the Drivers. For non-Apple drives, update the drivers on the volume (this rewrites the SCSI partition information as well) using the utility that came with the disk. Reset the parameter RAM using the Control Panel.
c. If it still cannot be booted or does not show up at the Finder after booting with a floppy, the volume is too weird and should be reinitialized.

3) The disk will boot but hangs part way through the boot process.

This is when you can see the volume is being accessed by the run light (LED) on the front panel, and the booting seems to work but never makes it to the Finder. This implies that all is well until the System tries to actually launch the Finder or Startup Application. It could also be that the System file is causing something to hang.

The sequence:

a. Power down completely.
b. Boot with a floppy so that the floppy is the startup disk and the volume in question can be seen at the Finder.
c. Delete all System Folders on the hard disk. Put a new System Folder on the disk. This will presumably fix a corrupted System file.
d. If still funky, show the disk who's boss.

4) There are data errors while the disk is running.

This case usually evidences itself by messages at the Finder when trying to copy files. Messages like "The file ^0 could not be read and was skipped" usually mean that the drive is passing back I/O errors. This usually means that there is a hardware failure, but it can occasionally be caused by bad sectors on the disk itself. If the sectors are actually bad, it is generally necessary to reinitialize the volume.

The sequence:

a. Power down completely. Reboot and see if the same file gives the same error.
b. Run the HD SC Setup (or utility that came with your drive) and perform the Test operation. This will fail if there are bad blocks on the device. If there are bad blocks, it is necessary to reinitialize the volume.
c. Check the SCSI terminators to be sure they are plugged in correctly. There can be no more than two terminators on the bus. If you have more than one SCSI drive you must have two terminators. If you only have one drive, use a single terminator. If you have more than one drive, the two terminators should be on opposite ends of the chain. The idea is to terminate both ends of this wire that goes through all of the devices. If you have a Macintosh II or SE with an internal drive, that drive will already have a terminator inside the Macintosh at the front of the cable.
d. Make sure the SCSI cables you are using are OK, by swapping them with known good ones. If the problem disappears, the cable is suspect.
e. Swap the terminators in use with known good ones to be sure they are OK.
f. Try the drive and cable on a different Macintosh to be sure the Macintosh is OK.

5) The disk is very slow returning to the Finder.

If the computer has gotten slower with age, it is probably due to a problem with the Desktop file. If a volume has been used for a long time, the Desktop file can grow to be very large (Hundreds of K). Reading and using a file that big can slow down the Finder when it is drawing the desktop. If you have a large number of files in the root directory, this will also slow the computer down. A large number (500-1000) of files in a given folder can cause performance problems as well. If a volume has been used for a long time, it can also have become fragmented.

The sequence:

a. Rebuild the Desktop file and see if it gets faster.
b. Look for large numbers of files in a given directory and break them up into other folders if needed.
c. Run Disk First Aid to be sure the volume is not damaged.
d. Reinitialize the volume and restore the data using File Manager calls to fix a fragmentation problem. Using the Finder, or a backup program that reads and writes files is a way to use only File Manager calls. You cannot fix a fragmentation problem by doing an image backup and restore.

6) The computer crashes or hangs when returning to the Finder.

This can happen if the Desktop file becomes corrupted. There are occasions when this can happen if the HFS structures on the volume are damaged.

The sequence:

a. Rebuild the Desktop file.
b. Run Disk First Aid to be sure the volume is not damaged; a boot floppy with the Set Startup set to Disk First Aid can allow you to test a volume that cannot be displayed at the Finder.
c. The path of ultimate recourse if nothing else seems wrong with the volume.

7) The disk appears in a "This disk is bad" dialog.

This is the worst of the possible errors that generally happen to hard disks. If the message is "This disk is bad" or "This is not a Macintosh disk", the HFS structures on the volume have been damaged. In particular, the Master Directory block on the volume has been damaged. The driver and SCSI partition information are probably OK, since this dialog shows up when the Finder tries to mount a damaged volume. This means that the `PBMountVol` call failed. Don't click the Initialize button unless you are sure you want the volume to be erased. In these cases, it is nearly always better to just reinitialize the volume after you have saved whatever information you can.

The sequence:

a. Power down completely. Occasionally the controller in the hard disk itself can crash.

b. Run Disk First Aid. For these cases, it is usually necessary to create a boot floppy with Set Startup set to Disk

First Aid. When the floppy is booted, Disk First Aid will be run before the Disk Inserted events are processed. When Disk First Aid sees the Disk Inserted event it will check the result from the `PBMountVol` and still allow you to test the volume, even if it can't be mounted.

c. If Disk First Aid cannot repair the disk, it might be worth writing a simple program to call the driver to read and write blocks. There is a copy of the Master Directory Block on the end of the volume, and the volume can sometimes be fixed by copying that block over a damaged block in sector 2. You can write a program that will find out how big the volume is by looking in the Drive Queue Element for the volume, reading the block that is one sector from the end (N-1), and writing that copy over sector 2. At this point, the volume is probably inconsistent, but it may allow you to use it long enough to get information off of it. It is sometimes possible to have Disk First Aid repair the volume at this point as well. Copying the sectors can also be done with sector edit utilities, if you can get them to recognize the volume at all.

d. If making a new copy of sector 2 does not work, but the driver is still being loaded at boot time, it is possible to write a program that will read sectors from the disk looking for information that you might need. You can have a reader program go through blocks looking for a specific pattern, like a known file name. This is usually done in desperation, but sometimes there is no other choice. If the data desired can be found in some form, it can sometimes be massaged back to a useful form much easier than recreating it.

e. Sometimes the volume will be so badly damaged that the SCSI partition information is also damaged and cannot be fixed with the Update in the hard disk utility. In this case, it is usually still possible to perform direct SCSI reads, without going through the driver. Using the driver is preferable, since it knows how to talk to the drive better than you would, but sometimes the driver is not available. Using direct SCSI reads should be a last ditch effort since the SCSI Manager can be very challenging to use. This should only be used if there is irreplaceable data on the volume that cannot be read by any other means.

f. Even if the volume is recovered, it still should be reinitialized (after the data is recovered) to be sure that any hidden damage is repaired.

8) The disk never shows up at all.

The disk appears to be missing. The volume does not show up at the Finder, and does not show up in HD SC Setup. At boot time the access light (LED) does not flash. This is usually a hardware problem as well. The drive is not responding to SCSI requests at all, so the system cannot tell a drive is attached.

The sequence:

a. Power down the system, including the hard disk.

b. Make sure that the SCSI ID on the drive does not conflict with any other in the system, including the Macintosh, which is ID 7. (If you have an internal hard drive, it should be ID 0.)

c. Check the SCSI terminators to be sure they are plugged in correctly. There can be no more than two terminators on the bus. If you have more than one SCSI drive you must have two terminators. If you only have one drive, you should use a single terminator. If you have more than one drive, the two terminators should be on opposite ends of the chain. The idea is to terminate both ends of this wire that goes through all of the devices. If you have a Macintosh II or SE with an internal drive, that drive will already have one terminator inside t he Macintosh at the front of the cable.

d. Make sure the SCSI cables you are using are OK, by swapping them with known good ones.

e. Swap the terminators in use with known good ones to be sure they are OK.

f. Try the drive and cable on a different Macintosh to be sure the Macintosh is OK.

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These boots are made for wokking

Remember, the goal here is to make the system be as stable as possible. If things are acting strange, it doesn't hurt to go through the entire process of testing the drive. The test procedure takes a little time but is non-destructive for the data that is there. If something catastrophic has happened to the disk, it is better to spend some time backing up the data, initializing the volume, and restoring the data than it is to lose some work later on due to some other permutation of the same problem. Unless you are sure that the volume is in an undamaged state, you are better off using a file-by-file backup operation than an image backup, since the image backup will copy any damage as well as the data.

If there are situations that you run into that are not covered by this technical note, please let us know so that they can added.

If this technical note helps even one person save some data that would otherwise be lost, it will have been worthwhile. Hope it helps.

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References

Hard Disk Users Manual

Technical Note M.HW.PlusROMVers -- Macintosh Plus ROMs

Technical Note M.DV.BootBlocks -- Boot Blocks

Technical Note M.FL.BlessedFolder -- Finding the "Blessed Folder"

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