

HARD DISK 20 TECHNICAL PROCEDURES

TABLE OF CONTENTS

Section 1 - Basics

Introduction.....	1.2
Setting Up.....	1.2
Initializing.....	1.3

Section 2 - Diagnostics

Introduction.....	2.2
Diagnostics	
Equipment Needed.....	2.2
Running the Test.....	2.2

Section 3 - Troubleshooting

Introduction.....	3.2
Things To Remember.....	3.2
Hard Disk 20 Troubleshooting Flowchart.....	3.4
Notes.....	3.5
Appendix - Special Problems	
Startup Problems.....	3.6
Daisy-Chaining Problems.....	3.9

©Apple Computer, Inc., 1985, 1986.
No part of this document may be reproduced in any form
without the written permission of Apple Computer, Inc.

Macintosh is a trademark of Apple Computer, Inc.
Apple and the Apple logo are registered trademarks of
Apple Computer, Inc.

Section 4 - Take-Apart

Tools Needed.....	4.3
Top Cover.....	4.3
Controller Card.....	4.5
Bottom Shield.....	4.7
Fan.....	4.9
Power Supply.....	4.11
Hard Disk Assembly.....	4.13

Section 5 - Illustrated Parts List

Hard Disk 20 Illustrated Parts List and Diagrams.....	5.1
---	-----

Hard Disk 20 Technical Procedures

Section 1

Basics

Contents:

Introduction.....	1.2
Setting Up.....	1.2
Initializing.....	1.3

INTRODUCTION

The Hard Disk 20 gives the Macintosh™ personal computer 20 megabytes of storage. Twenty megabytes equals about 50 single-sided 3 1/2 inch diskettes. The Hard Disk 20 is connected to the external drive port on the back of the Macintosh. If you need more storage, you can link another Hard Disk 20 or an external disk drive to the first Hard Disk 20 connected.

SETTING UP

NOTE: The Hard Disk 20 is a mechanical device with moving parts. Rough handling such as jarring or bumping, especially while the hard disk is running, can cause a mechanical failure or damage stored information.

Connecting and Switching On the Hard Disk 20

1. Make sure power is off to both the Hard Disk 20 and the Macintosh.
2. Attach the interface cable from the Hard Disk 20 to the external drive port on the rear of the Macintosh.
3. Attach the Hard Disk 20 power cord to the hard disk, and plug the power cord into a three-prong AC outlet.
4. Power on the Hard Disk 20. (The Macintosh should be off.)

The hard disk will whir and chirp. In 15 seconds the green light in front should be steady (unblinking).

5. For the Macintosh 512K (or 128K):

Insert the Hard Disk 20 Startup diskette into the internal drive on the Macintosh and power on the system.

If the Hard Disk 20 has already been initialized, the Macintosh will eject the Hard Disk 20 Startup diskette, and the desktop will appear with a hard disk icon in the upper right-hand corner.

If the Hard Disk 20 is damaged or uninitialized, the Macintosh will give you options to repair it or initialize it.

For the Macintosh Plus:

Power on the Macintosh Plus, and the desktop will appear with a hard disk icon in the upper right-hand corner.

If the Hard Disk 20 is damaged or uninitialized, the Macintosh Plus will display a diskette icon with a flashing question mark on the screen.

Switching Off the Hard Disk 20

IMPORTANT: Never switch off the power if the green light is blinking. You may lose information on the hard disk.

1. If you are working with an application program, quit and return to the desktop.
2. Wait till the green light is steady and unblinking. Power off the Hard Disk 20.
3. Power off the Macintosh.

INITIALIZING

If you need to reinitialize (or erase) the hard disk, everything stored on the hard disk will be removed permanently. This is the major reason for keeping backup diskettes. Refer to "Startup Problems" in **Section 3, Troubleshooting**, before you reinitialize the hard disk.

If the customer has not backed up his files and the hard disk will not come ready after following the troubleshooting flowcharts, the information that was stored is gone.

To reinitialize a Hard Disk 20:

1. Pull down the **Special** menu and select **Erase Disk**.
2. Copy the **System Folder** from the Hard Disk 20 Startup diskette onto the hard disk icon in the upper right-hand corner.
3. Copy any applications and backup files onto the hard disk.

Hard Disk 20 Technical Procedures

Section 2

Diagnostics

Contents:

Introduction.....	2.2
Diagnostics	
Equipment Needed.....	2.2
Running the Test.....	2.2

INTRODUCTION

The Hard Disk Drive Diagnostic is a pass/fail functionality test. It runs a self-test, ID test, random single block test, random multiblock read test, and scandrive test.

NOTE: Before running the diagnostic, make a backup copy of the Hard Disk Drive Diagnostic diskette. For information on making disk copies, refer to the Macintosh Owner's Manual.

DIAGNOSTICS

Equipment Needed

Known-good Macintosh
Known-good Hard Disk Drive Diagnostic diskette
Questionable Hard Disk 20

Running the Test

1. Set up the hard disk and the Macintosh (refer to **Section 1, Basics**).
2. Insert the Hard Disk Drive Diagnostic diskette.

The diskette icon should appear in the upper right-hand corner.
3. Turn on the Hard Disk 20.
4. Double click on the diskette icon.
5. Double click on the **Hard Disk Drive Diagnostic Test** icon. After a few moments, the test window will appear.
6. The type of drive to be tested is shown in the title bar of the window. To switch types, choose the type of drive from the **Drive** menu.
7. From the test window, you may select:
 - The short 15-minute test;
 - The extended overnight test (20 iterations of the short test).

Make your test-length selection by clicking in the appropriate box.

8. Click the **Start** button. The diagnostic will go through various tests. The **Notes** box at the bottom of the window will display the progress of the test.

You may stop the test at any time by clicking the **Stop** button. If you click on the **Pause** button, the test will pause until you click on the **Continue** button.

At the end of the test, a dialog box will give you pass/fail information for the drive tested. Click **OK** to return to the test window.

You may quit the diagnostic program at any time (if the test is not running) by choosing **Quit** from the **File** menu.

If the hard disk fails the diagnostic, refer to **Section 3, Troubleshooting**.

Hard Disk 20 Technical Procedures

Section 3

Troubleshooting

Contents:

Introduction.....	3.2
Things To Remember.....	3.2
Hard Disk 20 Troubleshooting Flowchart.....	3.4
Notes.....	3.5
Appendix - Special Problems	
Startup Problems.....	3.6
Daisy-Chaining Problems.....	3.9

INTRODUCTION

This troubleshooting guide contains a flowchart and a table of explanations for the flowchart.

Read **Things to Remember** before you begin troubleshooting. There are numerous things you need to know about the Hard Disk 20 in order to troubleshoot it effectively.

THINGS TO REMEMBER

The Hard Disk 20 has a total of three exchange modules: the controller card; the power supply; and the hard disk assembly, which consists of the hard disk and the analog card. At first glance the Hard Disk 20 may appear to be simple to troubleshoot; however, there are a few important things you need to do and be aware of before starting.

1. Be sure to stress to your customers the importance of backing up all files on diskette. This will make your job easier and the customer a lot happier if the hard disk becomes faulty.
2. If the customer has not backed up his files but you can get the hard disk to come ready by following the troubleshooting flowchart, you may still be able to recover some or all of his data by following the procedures in "Startup Problems" (in this section). **Do not reinitialize (or erase) the hard disk until you have tried all possible data recovery procedures.** Once you reinitialize (or erase), everything stored on the hard disk is removed permanently.

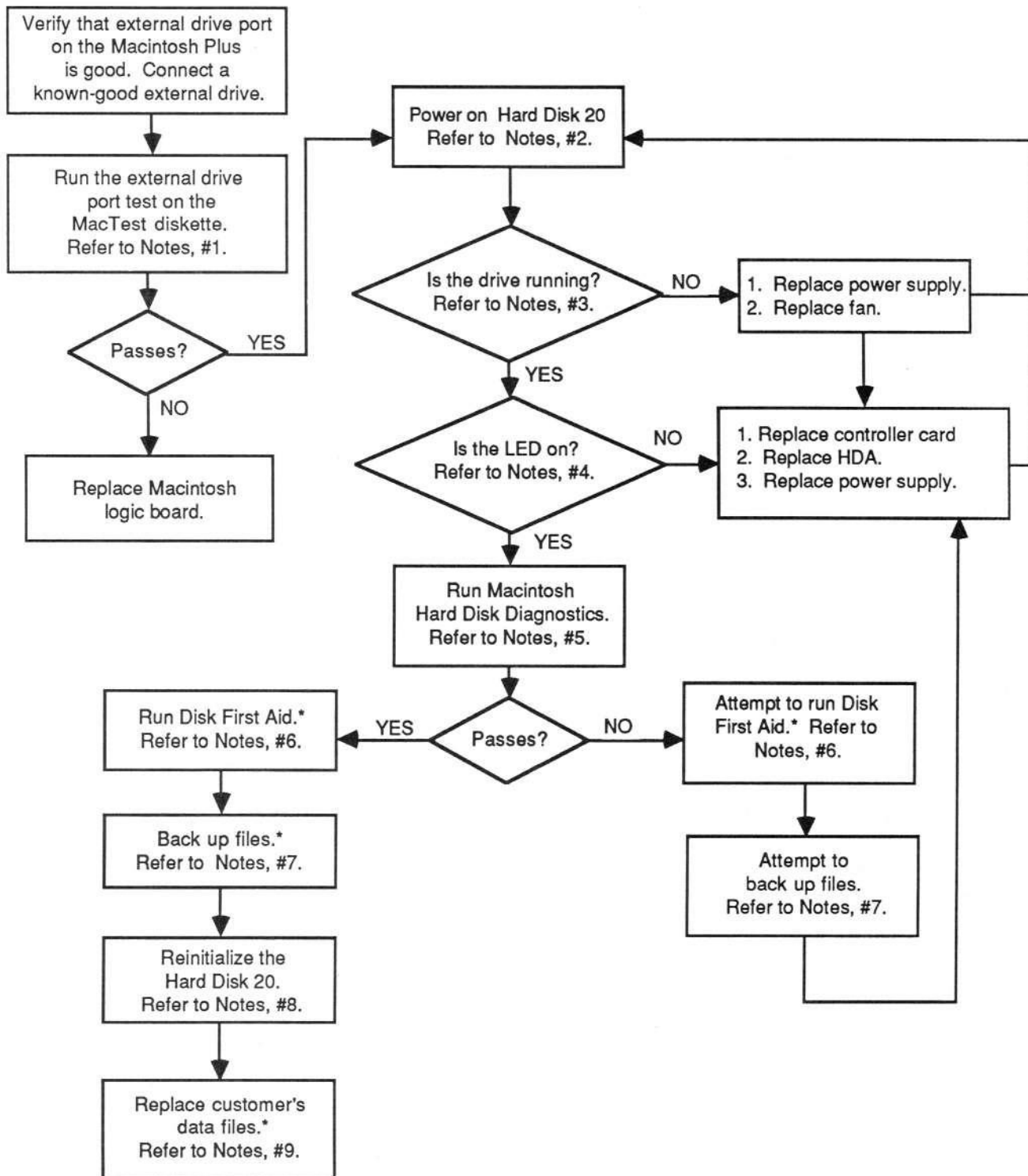
If the hard disk will not come ready after you have followed the procedures in the troubleshooting flowchart, there is no way to recover the data.

3. Be sure to test on a **known-good** Macintosh. Once the hard disk is functioning properly, test it with the customer's Macintosh.
4. When returning the hard disk assembly for exchange, it **must** be shipped in Apple-approved packaging. Save the exchange hard disk assembly boxes and packaging materials for future use.

5. With a Macintosh Plus, a Hard Disk 20 Startup diskette is not necessary.

CAUTION: The interface cable from the controller board to the hard disk is not a standard ribbon cable. Do not substitute a different ribbon cable for this connection. Replace only with the specified cable from the parts list.

HARD DISK 20 TROUBLESHOOTING FLOWCHART



NOTES

Perform steps marked with an asterisk (*) only if the customer has not backed up his data files.

1. This step verifies that the external drive port on the system is functioning correctly. Refer to **Macintosh Technical Procedures, Section 2, Diagnostics**, for complete information on running the external drive test.
2. Power on the Hard Disk 20. Do not turn on the system until told to do so.
3. You should hear the hard disk come up to operating speed. Verify that the fan is working by looking at it on power up with the top cover removed.
4. The LED is on when the hard disk is ready. It flashes when the heads are moving. If the light is not on and steady after 60 seconds, this usually indicates that the HDA assembly is bad.
5. Refer to **Section 2, Hard Disk 20 Diagnostics**.
- *6. Disk First Aid is a program that attempts to repair the file structure on the hard disk. Refer to "Startup Problems" in this section for instructions.
- *7. Back up as many files as possible before continuing.
8. To reinitialize the hard disk, refer to **Section 1, Basics**.
- *9. After initializing the hard disk, copy the customer's data from diskettes back onto the hard disk.

APPENDIX - SPECIAL PROBLEMS

Startup Problems

NOTE: These procedures will cure failures due to software (Finder) problems. They do not address hardware problems, which may be the original cause of the problem. Refer to the Hard Disk 20 Troubleshooting Flowchart for possible hardware causes.

If the Finder program on the Hard Disk 20 is corrupted, the following four symptoms will appear when you attempt to start up from the Hard Disk 20:

- a. The system will fail to complete its startup.
- b. The diskette will be ejected.
- c. The Macintosh and the Hard Disk 20 will lock up (will not accept mouse or keyboard input).
- d. The Hard Disk 20 icon will not be present on the desktop.

Perform the following four procedures one at a time, in the order listed, to attempt to correct any or all of the problems listed above.

1. Run Disk First Aid on the Hard Disk 20.

Disk First Aid can be used to repair any hard disk or double-sided 800K diskette that uses the Macintosh hierarchical file system (HFS).

Disk First Aid is included on the Hard Disk Drive Diagnostic diskette for the Macintosh. The diskette must be used as the startup diskette.

To repair a Hard Disk 20:

- a. Insert the Hard Disk Drive Diagnostic diskette into the internal drive of the Macintosh. Power on the Macintosh first, then the Hard Disk 20.
- b. Open the diskette icon, then the **Disk First Aid** icon.
- c. A display window will list one of the attached drives. Click on **Drive** to change selections. When the Hard Disk 20 is listed, click on **Open**.

A second screen will appear listing the volume name

- d. Select **Repair Automatically** from the **Options** menu.
- e. Click on **Start** to begin the repair and verification process. You may stop the application at any time by clicking on the **Stop** button. Or you may choose **Pause**, then **Resume**.
- f. When the Hard Disk 20 has been repaired and/or verified, pull down the **File** menu and click on **Close**.
- g. When you are finished, select **Quit** from the **File** menu.

2. Replace the Hard Disk 20's Finder File.

- a. Power off the Macintosh, and insert the Hard Disk 20 Startup diskette into the internal disk drive.
- b. Power the Macintosh on.
- c. When you see the **Welcome to Macintosh** screen, hold down the mouse button until the desktop appears and the wristwatch turns into a pointer.

The Hard Disk 20 Startup diskette is now the current startup diskette.

- d. Drag the **System** file and the **Finder** file from the **System Folder** on the Hard Disk 20 Startup diskette to the **Hard Disk 20** icon to replace the corrupted files.
- e. On completion, power off the Macintosh and start up from the Hard Disk 20 Startup diskette.
- f. Run the diagnostics.

If the problem still exists, continue to step 3.

3. Rebuild the Hard Disk 20's Desktop.

- a. Press and hold down the <Command> and <Option> keys, while you start up from the Hard Disk 20 Startup diskette. (Be sure to hold down both keys continuously during the entire booting sequence.)

A message will appear asking if you want to rebuild the Desktop file.

- b. Select OK.

The Desktop will be rebuilt. (This will take a few minutes.)

- c. Power off the Macintosh and start up from the Hard Disk 20 Startup diskette.

- d. Run the diagnostics.

If the problem still exists, continue to step 4.

WARNING: If you perform step 4, all data on the hard disk will be erased.

4. Initialize the Hard Disk 20.

- a. Press and hold down the <Command>, <Option>, and <Tab> keys while you start up from the Hard Disk 20 Startup diskette. (Be sure to hold down all three keys continuously during the entire startup sequence.)

A message will appear asking if you want the Hard Disk 20 completely erased and its contents destroyed.

- b. Select OK.

This choice erases all data on the hard disk.

- c. Run the diagnostics.

Daisy-Chaining Problems

Up to three additional hard or floppy disk drives may be "daisy-chained" to the Hard Disk 20 through the expansion port that is connected to the Hard Disk 20's controller board. If a customer has attempted to set up a daisy-chain and has found that not all of his attached devices are recognized by the Macintosh (that is, their icons don't show up on the desktop) or that their operation is intermittent or "flaky," the problem **may** be in the Hard Disk 20's expansion port linkage. Attempt to isolate the problem by using the following troubleshooting procedure:

1. Check for faulty or loose cables.
2. If the cables are OK, check to see if each of the daisy-chained drives will work when connected directly to the Macintosh.
3. If the drives function normally when connected directly to the Macintosh, then the likely cause is a faulty expansion port connector on the controller board of the first Hard Disk 20 in the chain, and the controller board must be replaced.

Hard Disk 20 Technical Procedures

Section 4

Take-Apart

Contents:

Tools Needed.....	4.3
Top Cover.....	4.3
Controller Board.....	4.5
Bottom Shield.....	4.7
Fan.....	4.9
Power Supply.....	4.11
Hard Disk Assembly.....	4.13

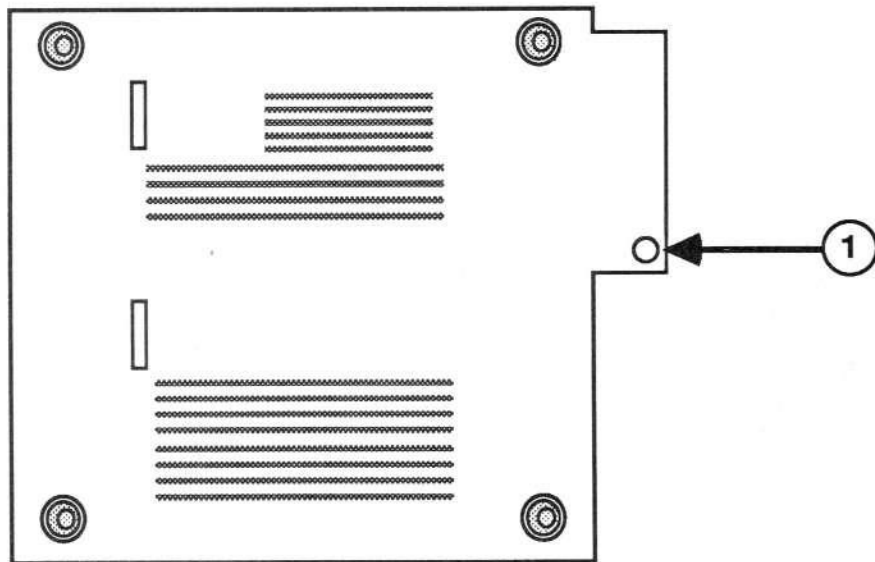


FIGURE 1

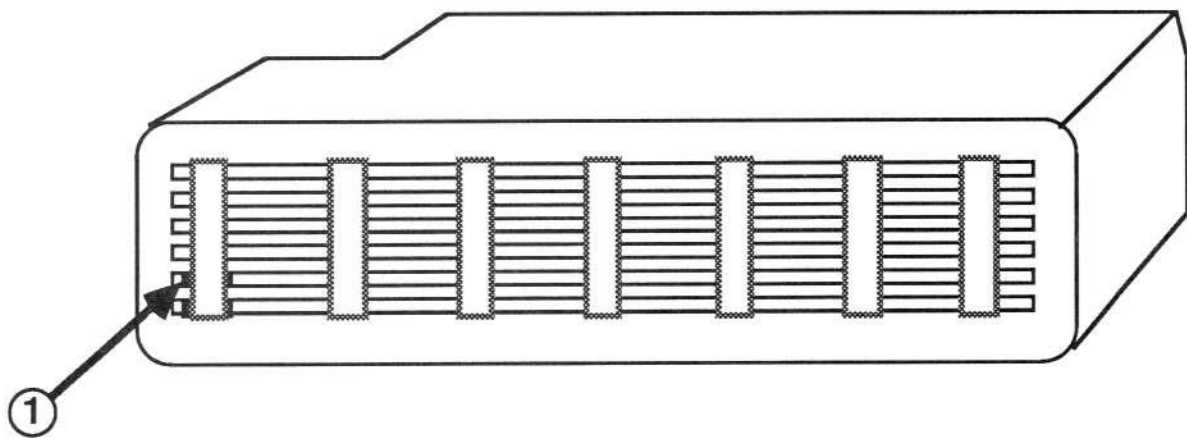


FIGURE 2

TOOLS NEEDED

The following will be needed for the take-apart procedures:

- Macintosh pull-apart tool
- Macintosh torx driver
- A #2 phillips screwdriver
- A jeweler's screwdriver
- A medium flathead screwdriver

REMOVE AND REPLACE TOP COVER

Remove

1. Gently place the Hard Disk 20 upside down.
2. Remove the one torx screw shown in Figure 1, #1.
3. Locate the two tabs, one on each side of the hard disk (see Figure 2, #1).
4. Gently insert a jeweler's screwdriver to release one of the tabs, and use the Macintosh pull-apart tool to lift the cover up. Repeat this for the other side of the hard disk.
5. Pull the cover back and lift it free.

Replace

1. Slide the cover towards the front and gently push it into place.

You will hear a "pop" when the tabs interlock.

2. Replace the screw shown in Figure 1, #1.

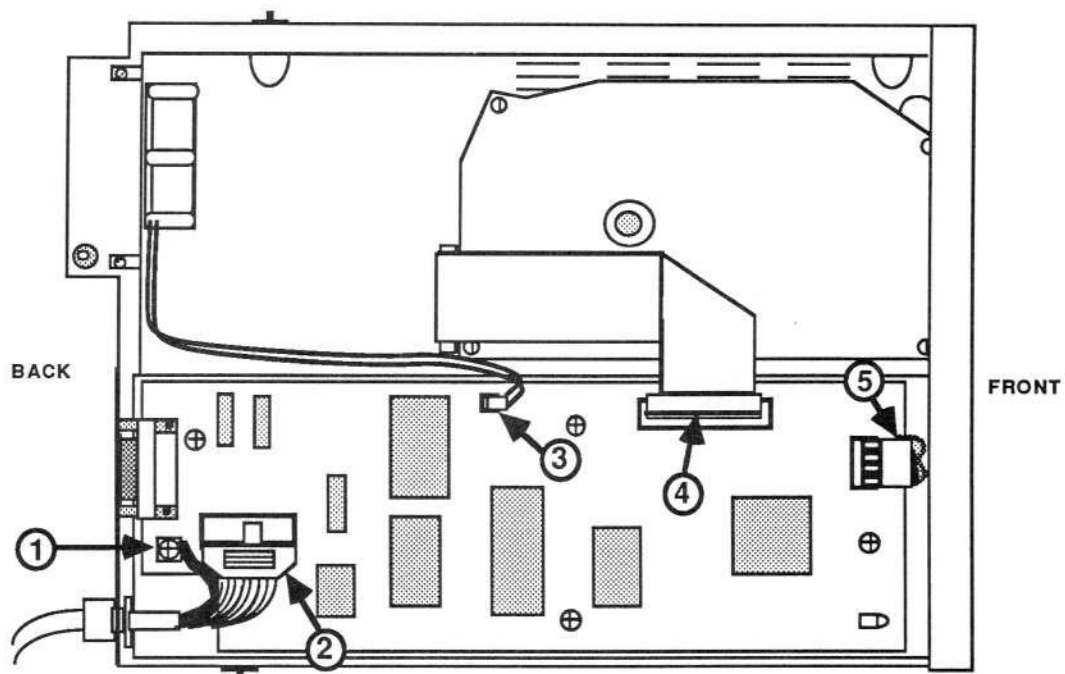


FIGURE 3

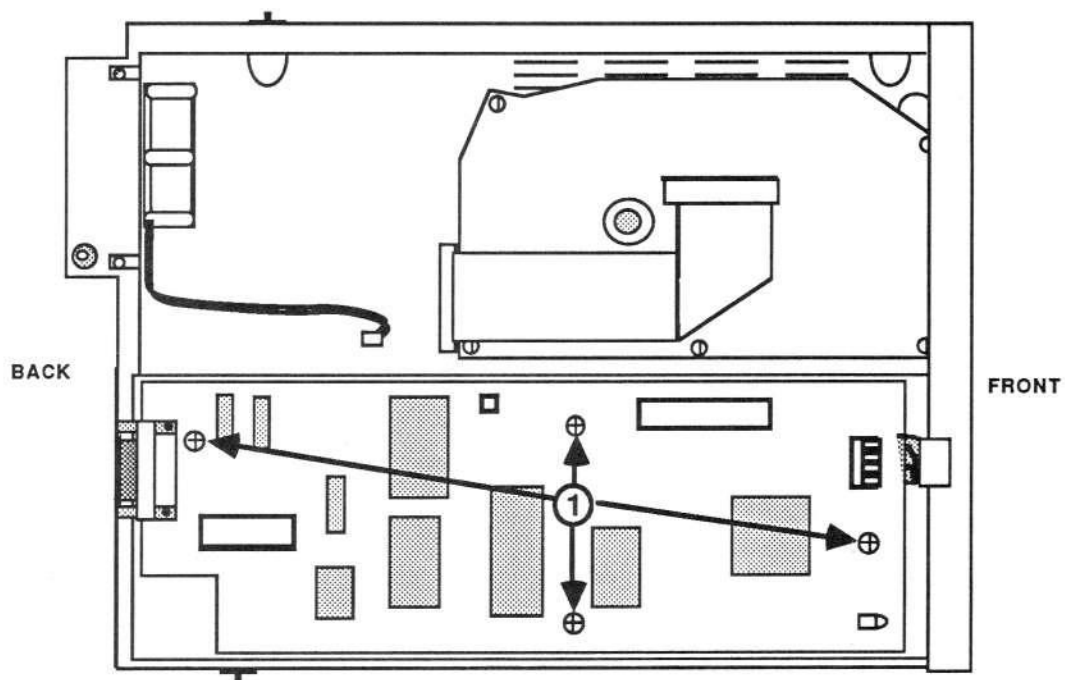


FIGURE 4

REMOVE AND REPLACE THE CONTROLLER BOARD

Remove

1. Remove the top cover.
2. Remove the grounding screw (see Figure 3, #1).
3. Disconnect the interface cable and remove it (see Figure 3, #2).
4. Unplug the fan connector (see Figure 3, #3).
5. Disconnect the interface cable from the controller board to the hard disk (see Figure 3, #4).
6. Unplug the power supply connector (see Figure 3, #5).
7. Remove the four screws (see Figure 4, #1).
8. Lift off the controller board.

Replace

1. Place the controller board on top of the power supply so the standoffs line up.
2. Replace the four screws (see Figure 4, #1).
3. Plug in the power supply connector (see Figure 3, #5).
4. Connect the interface cable from the hard disk to the controller board (see Figure 3, #4).
5. Plug in the fan connector (see Figure 3, #3).
6. Reposition the interface cable and connect it (see Figure 3, #2).
7. Replace the grounding screw (see Figure 3, #1).
8. Replace the top cover.

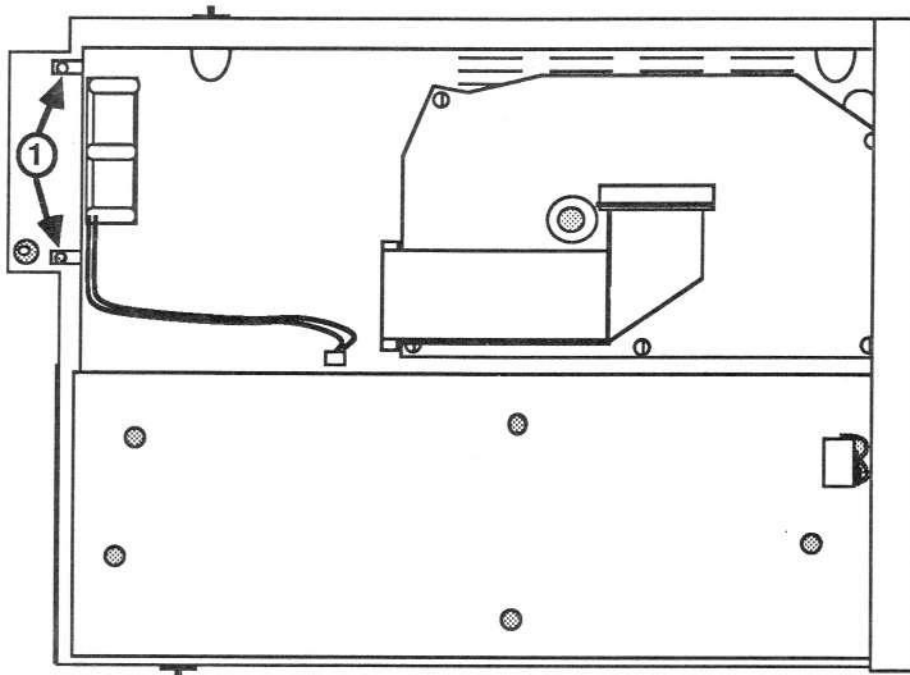


FIGURE 5

REMOVE AND REPLACE BOTTOM SHIELD

Remove

1. Remove the top cover.
2. Remove the controller board.
3. Remove the two screws (see Figure 5, #1).
4. Gently tilt and lift the bottom shield (with the power supply and hard disk attached) out of the plastic case.

Replace

1. Gently position and place the bottom shield (with the power supply and hard disk attached) into the plastic case.
2. Replace the two screws (see Figure 5, #1).
3. Replace the controller board.
4. Replace the top cover.

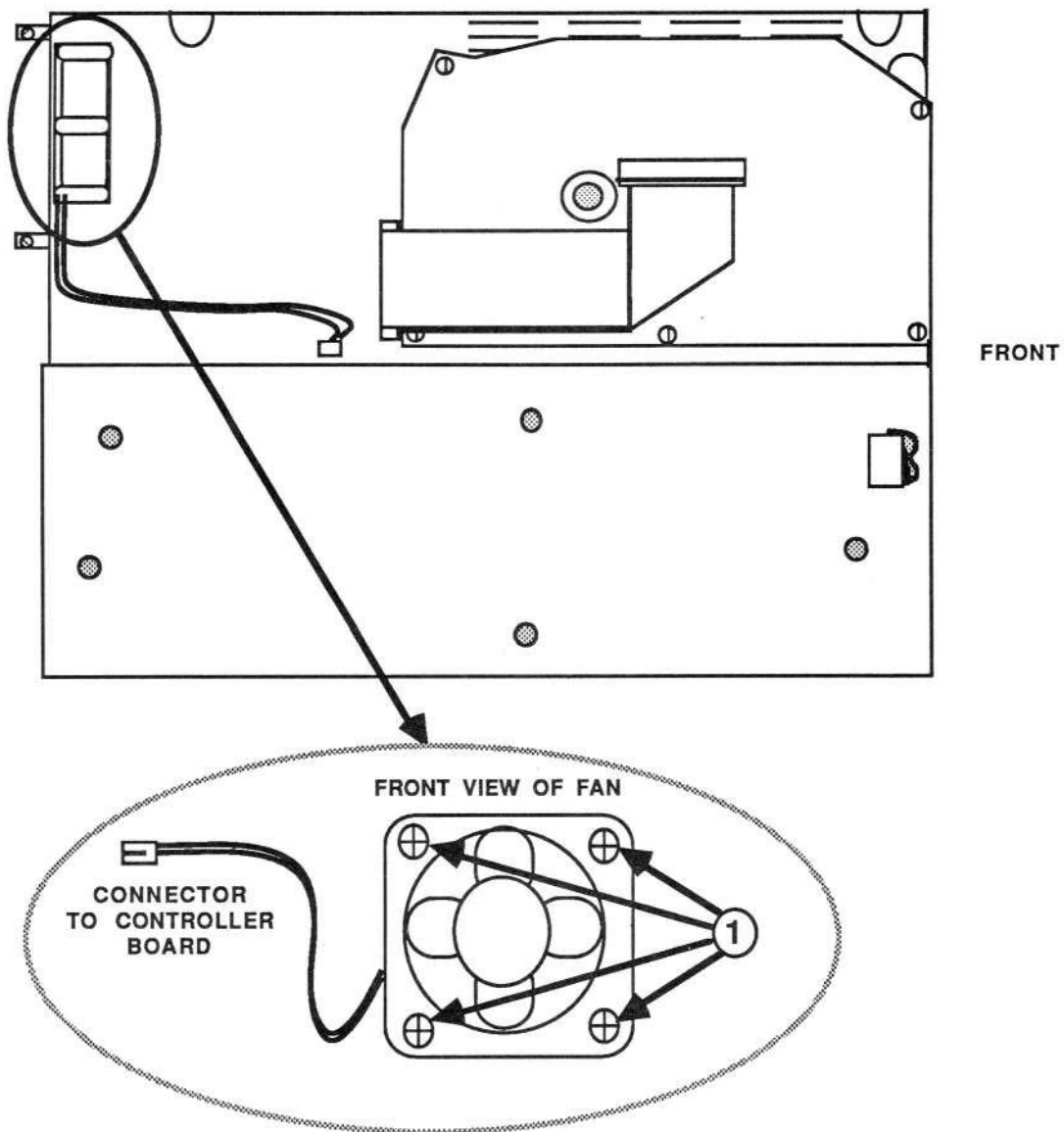


FIGURE 6

REMOVE AND REPLACE THE FAN

Remove

1. Remove the top cover.
2. Remove the controller board.
3. Remove the bottom shield.
4. Remove the four screws holding the fan in place (see Figure 6, #1).
5. Remove the fan.

Replace

1. Position the fan so that the air flow arrow embossed on the side of the fan is pointing to the rear of the machine and the rotation arrow embossed on the side of the fan is pointing up.
2. Replace the four screws (see Figure 6, #1).
3. Replace the bottom shield.
4. Replace the controller board.
5. Replace the top cover.

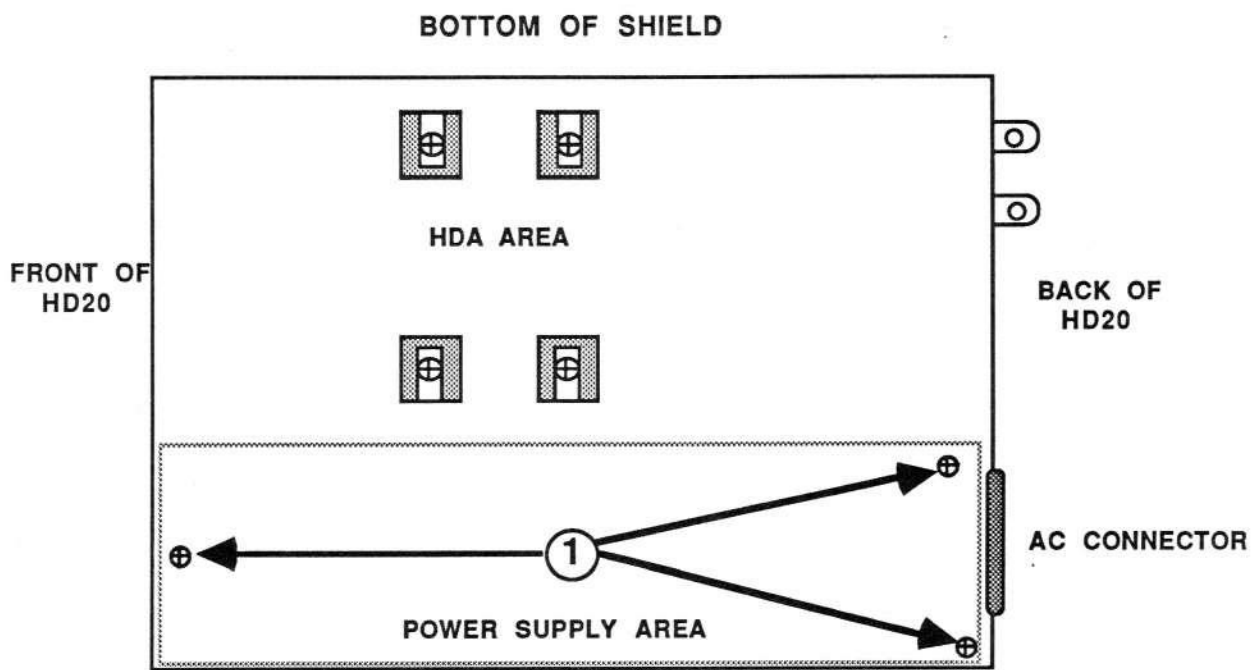


FIGURE 7

REMOVE AND REPLACE THE POWER SUPPLY

Remove

1. Remove the top cover.
2. Remove the controller board.
3. Remove the bottom shield with the hard disk and power supply from the plastic case.
4. Gently place the bottom shield upside down.
5. Remove the three screws (see Figure 7, #1).
6. Remove the power supply.

Replace

1. Position the power supply so that the screw holes line up.
2. Replace the three screws (see Figure 7, #1).
3. Replace the bottom shield with the hard disk and power supply into the plastic case.
4. Replace the controller board.
5. Replace the top cover.

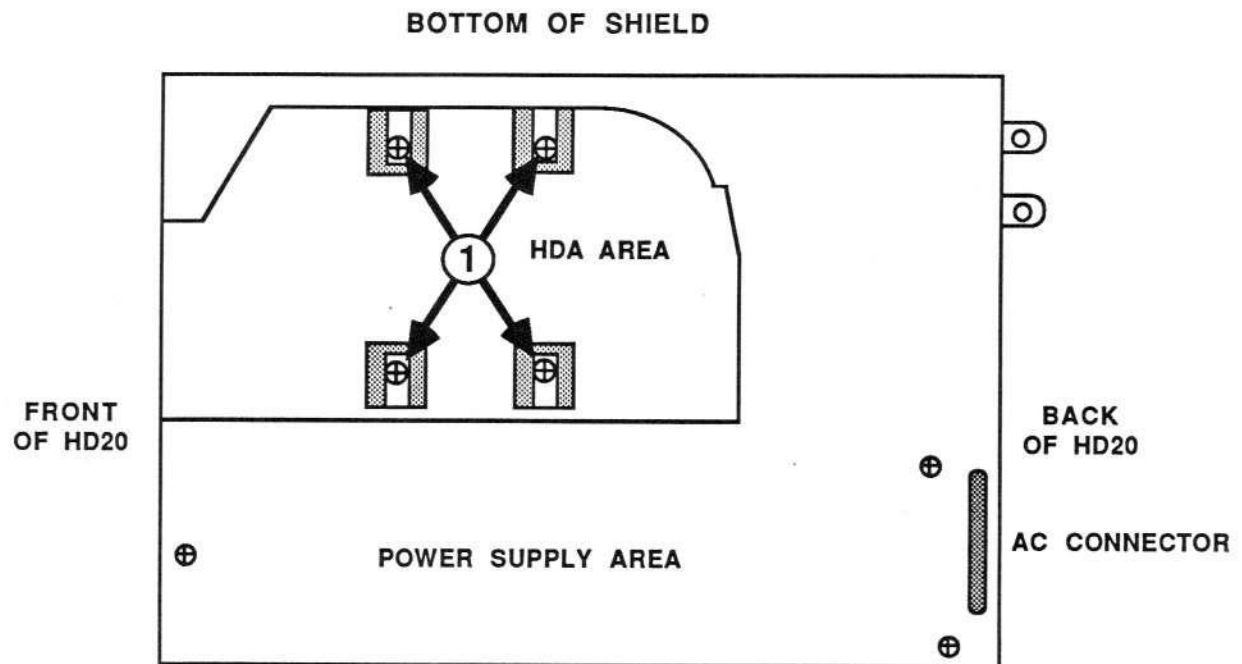


FIGURE 8

REMOVE AND REPLACE THE HARD DISK ASSEMBLY

Remove

1. Remove the top cover.
2. Remove the controller board.
3. Remove the bottom shield (with the hard disk and power supply attached) from the plastic case.
4. Gently place the bottom shield upside down.

CAUTION The interface cable from the controller board to the hard disk is not a standard ribbon cable. Do not substitute a different ribbon cable for this connection. Replace only with the specified cable from the parts list. Failure to do this can result in serious damage to the hard disk and/or controller board.

5. Remove the interface cable.
6. Remove the four screws (see Figure 8, #1).
7. Remove the hard disk assembly.

Replace

1. Position the hard disk assembly so the screw holes line up with the bottom shield.
2. Replace the four screws (see Figure 8, #1).
3. Connect the interface cable to the hard disk assembly.
4. Replace the bottom shield (with the hard disk and power supply attached) into the the plastic case.
5. Replace the controller board.
6. Replace the top cover.

Hard Disk 20 Technical Procedures

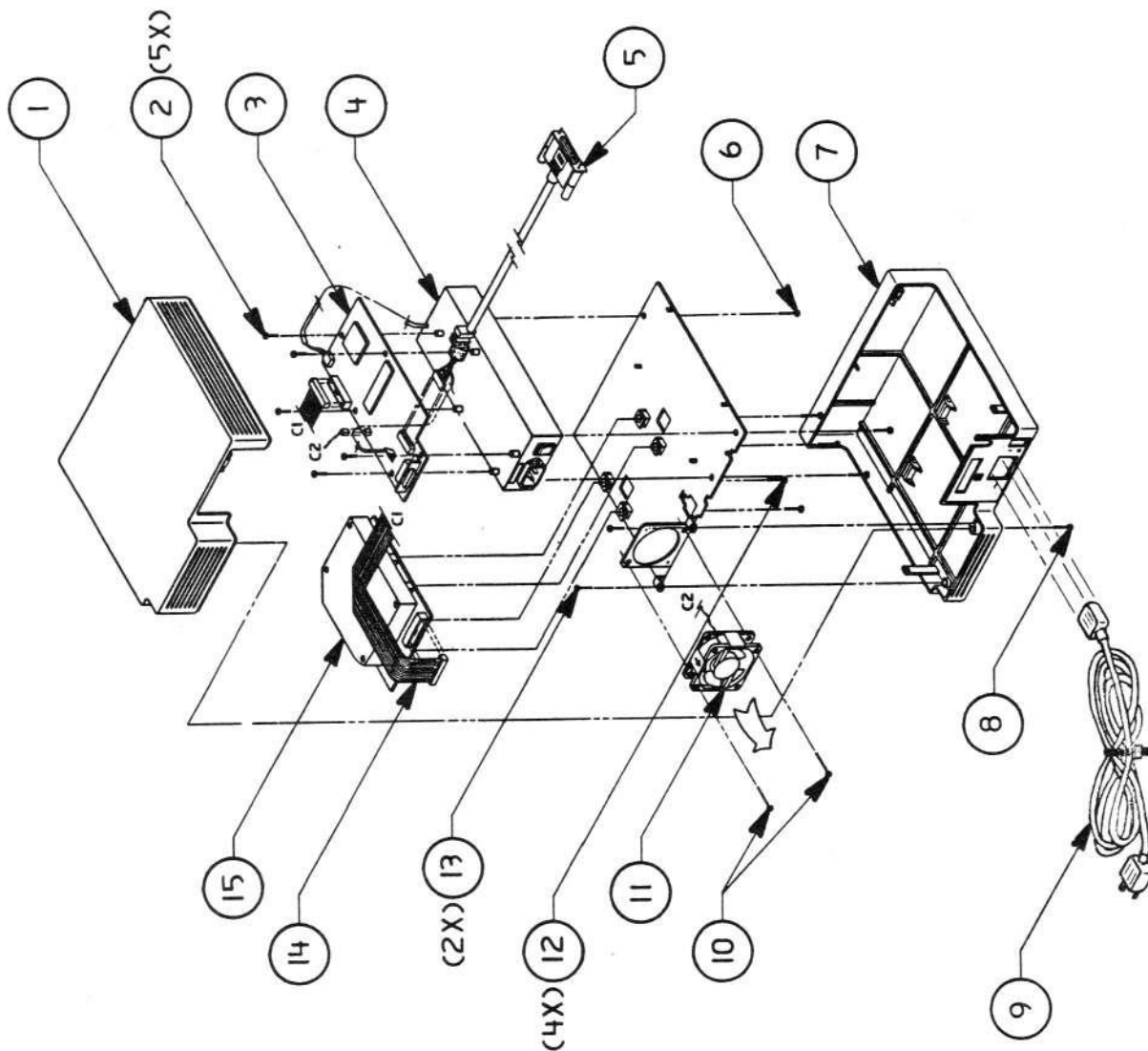
Section 5

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the Hard Disk 20, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

Hard Disk 20.....	5.3
-------------------	-----



HARD DISK 20

Item	Part No.	Description
1	815-0923	Top Cover
2	410-1306	Screw (controller + lug)
3	661-0300	HD 20 Controller Board
4	661-0301	HD 20 Power Supply
5	590-0324	Cable, HD 20 to Macintosh
6	415-3306	Screw (power supply)
7	630-5193	Bottom Cover
8	422-1007	Screw (case)
9	590-0260	Cable, Power
10	462-3103	Screw (fan)
11	720-5001	Fan
12	440-6105	Screw (Rodime)
13	462-4100	Screw (chassis to plastic)
14	590-0336	Cable, HDA to Controller
15	661-0302	HDA, 20 Meg, with Analog Board