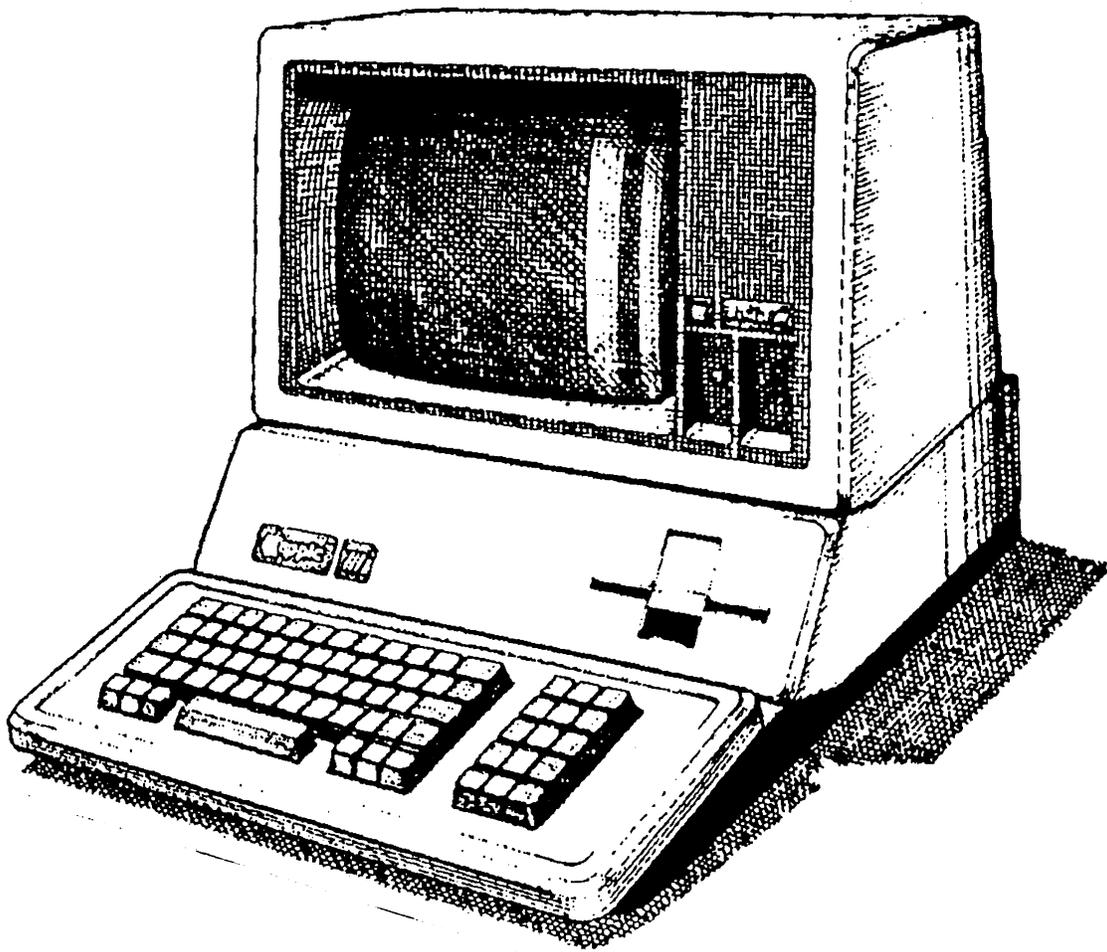




Apple /// Computer Information



DOCUMENT NAME		#
<i>Repair Info:</i>	<i>Apple</i>	226
<i>Disk III</i>	<i>Feb. 1987</i>	

Ex Libris David T. Craig

🍏 Apple Technical Procedures

Disk III

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Section 1 – Take-Apart

☐ CONTENTS

- 1.2 Case
- 1.3 Shield and Ribbon Cable
- 1.6 Analog Card
- 1.8 Drive Door

Note: If a step is underlined, detailed instructions for that step can be found elsewhere in this section.

□ CASE

Materials Required #2 Phillips screwdriver

Remove

1. Turn the drive over with the bottom-side up and remove the four Phillips screws.
2. Lift the bottom cover up from the rear and remove it. Turn the unit so that the top side is up and the back of the unit is toward you.
3. Remove the single Phillips screw from the back panel.
4. Holding on to the bottom front of the top cover, pull the cover slightly forward and up until it clears the interior parts of the drive. Set cover aside.

Replace

1. Replace the top cover. With the unit top side up, set the cover over the back edge of the Disk III; then pull the cover slightly forward as you slide it down over the disk drive door.
2. Replace the single Phillips screw on the back panel.
3. Turn the drive over and replace the bottom cover.
4. Replace the four Phillips screws and turn the drive top side up.

□ SHIELD AND RIBBON CABLE

Materials Required #2 Phillips screwdriver

Remove

1. Remove the case.
2. Remove the flat cable from the back of the drive by pressing the strain relief guard (see Figure 1) out of the slot and removing the cable.

Note: It can be difficult to release the strain relief guard. If so, slip a screwdriver inside the metal shield and pry down on the guard while simultaneously pulling down and out from outside. (You may use large pliers to compress the guard enough to separate it from the mounting bracket, but be sure you don't crush the cable.) The strain relief guard will come apart in two pieces.

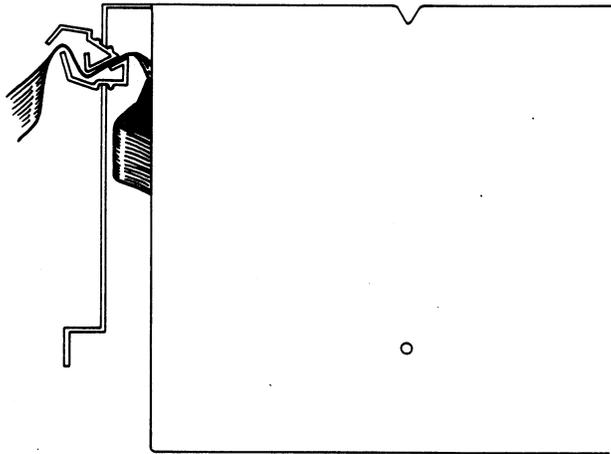


FIGURE 1

3. Remove the four Phillips screws holding the metal shield to the drive chassis.
4. Slide the metal shield cover back and off the drive, being careful not to pull on the cable as it is still connected to the analog card.

5. Disconnect the ribbon cable connector from the analog card (Figure 2, #2). It might be fastened very securely, so grasp the connector and pull back firmly until it disconnects. It may help to wiggle it gently back and forth as you pull back, but be careful not to bend the connector pins.

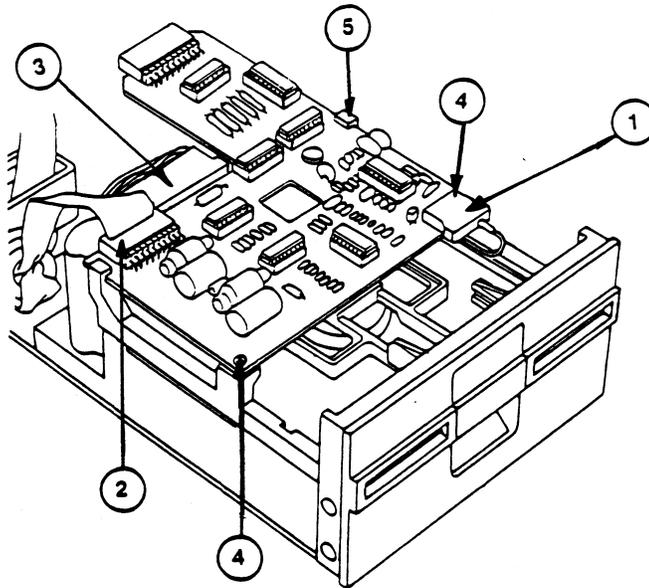


FIGURE 2

6. If you are replacing the ribbon cable, twist the cable connector slightly, push it through the toroids, and remove the toroids from the cable.

Replace

1. Place the two toroids onto one end of the replacement cable, looping the cable through the toroids. Leave about three inches of cable between the toroids and the connector (see Figure 3, #1).
2. Place the cable just above the toroids into the nylon cable holder and snap the holder shut.

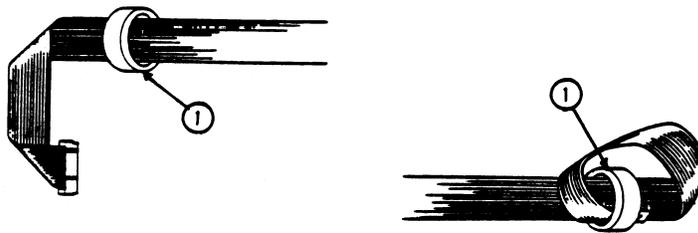


FIGURE 3

3. Attach the ribbon cable connector to the analog card, making sure that both rows of pins align with the holes in the connector (Figure 2, #2).
4. Replace the strain relief guard at the back of the metal shield. Fit the guard as closely as possible to the toroid while leaving yourself enough cable to work with.

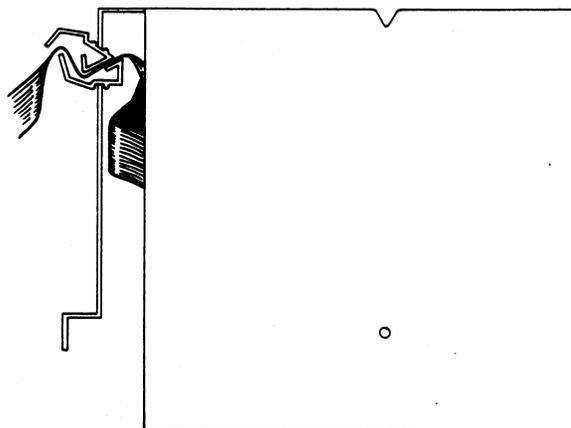


FIGURE 4

Make an "S" in the cable right next to the metal shield. Fit the bottom portion of the "S" into the one part of the strain relief with the triangle side fitting inside the metal shield. The other part of the strain relief fits with the triangle against the cable and into the lower portion of the strain relief. The top part then slips inside the metal shield (Figure 4).

5. Replace the four screws on the sides of the metal shield.
6. Replace the case.

□ ANALOG CARD

Materials Required

#2 Phillips screwdriver

Remove

1. Remove the case and drive shield.
2. Disconnect the read/write head connector from the front of the analog card (Figure 5, #1).
3. Disconnect the ribbon cable connector at the rear of the analog card (Figure 5, #2).
4. Remove the two screws at the front of the analog card (Figure 5, #4).
5. Slide the analog card back past the retaining slots at the rear, and then lift it out (Figure 5, #5).

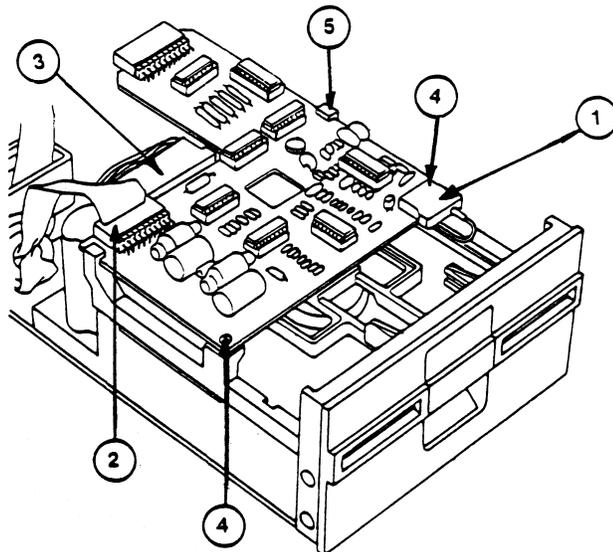


FIGURE 5

Replace

1. Slide the analog card through the retaining slots (Figure 5, #5) and into position.
2. Replace the two screws to hold the board in place (Figure 5, #4).
3. Attach the read/write head connector to the front of the analog card (Figure 5, #1). Ensure that there is just enough loop in the cable so that it doesn't pull down on the molex connector.
4. Attach the ribbon cable connector at the rear of the analog card (Figure 5, #2).
5. Replace the drive shield and case.

□ DRIVE DOOR

Materials Required

#2 Phillips screwdriver

Remove

1. Remove the case.
2. Remove the four Phillips screws, two on each side of the front bezel (panel) of the unit.
3. Tilt the bezel forward.
4. Remove the two screws that hold the door in place (Figure 6, #2), and remove the door assembly.

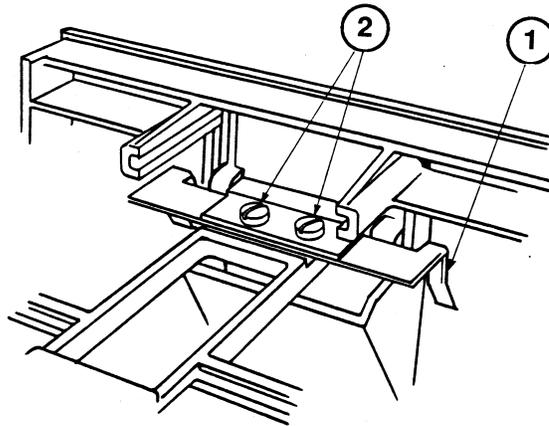


FIGURE 6

Replace

1. Set the new door in place, noting the position of the door guides (Figure 6, #1), and replace the screws to hold it in place.
2. Replace the bezel and two of the screws to hold it in place.
3. Insert a scratch diskette into the drive and allow it to center properly.

4. While gently closing the drive door, observe the two guide bars (Figure 6, #1), which are visible when viewed from the back of the drive looking toward the front. The guide should not bind against the diskette or cause it to buckle.
5. If there is binding, or if the door is crooked, unscrew the bezel and tilt it forward so that you can loosen the two screws that hold the door in place. Make sure the two plastic protrusions on the top of the door slide through the two plastic guides on the bezel and that the door looks centered.
6. With the bezel tilted forward, tighten the two screws to hold the door into the correct position.
7. Put the bezel into its normal position and replace the remaining two screws (Figure 6, #2).
8. Replace the case.

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Section 2 – Troubleshooting

☐ CONTENTS

2.2	Introduction
2.2	Materials Required
2.2	System Setup
2.3	Visual Inspection
2.4	Troubleshooting
2.4	Symptoms
2.4	System Will Not Boot
2.5	Drive Will Not Read or Write
2.5	Drive Has Trouble Reading
2.6	Drive Has Trouble Writing
2.7	Write-Protect Circuit Malfunctions
2.8	Diskette-Switched Circuit Malfunctions

Note: If a step is underlined, detailed instructions for that step can be found in Section 1, Take-Apart.

□ INTRODUCTION

The following pages outline the troubleshooting procedures for the Disk III disk drive analog card. **Follow all of the procedures in this section to ensure that no potential problems are overlooked.**

Materials Required

Small flatblade screwdriver
Apple III system with video display
Disk III mechanical assembly
External Disk III Interface Cable
Apple II Emulation diskette
Copy of *DOS 3.3 System Master* diskette (not write protected)
Copy of *Apple Business Basic* diskette
Blank diskette
Replacement ICs (one each):
 74LS125
 2003
 3470 (Motorola)
 3146
 74LS74
 74LS32

CAUTION: *Be sure to turn off the power to the computer before replacing any of the components on the analog card.*

System Setup

For the analog card to be correctly diagnosed, it must be the only unknown variable in the test system. So, using all known-good, verified components, assemble them as follows:

1. Place the analog card to be tested on the external drive mechanical assembly and connect the stepper motor cable and read/write head cable.
2. Connect the external cable between the analog card and the external drive port of the Apple III.

**Visual
Inspection**

Inspect the analog card for out-of-date versions by looking for printed circuit board (PCB) reworking, such as:

1. R32 (location D1) is missing.
2. IC at location E1 is missing.
3. Jumper wires soldered to the back of the board.

Return to Apple all analog cards with any of the above conditions. Next, examine the suspect analog card for damage such as:

1. Burned or melted ICs or sockets. Remove each of the six ICs and closely examine them and the sockets. Replace all damaged ICs with good ones. Return all analog cards with damaged sockets to Apple.
2. Capacitor C4 (large capacitor at corner of card) may be visibly damaged (burned, exploded, melted). These cards should be returned to Apple for repair.
3. Components other than the six ICs and capacitor C4 may be physically damaged and in need of replacement. These cards should be returned to Apple for repair.

WARNING: Do not use an eraser to clean gold contacts. Use only a liquid or spray contact cleaner and a clean cloth.

□ TROUBLESHOOTING

Symptoms

A malfunctioning analog card may manifest one of the following five symptoms:

1. Drive 1 will not boot (with bad external drive analog card connected).
2. Drive will not read or write (could destroy data).
3. Drive has trouble reading.
4. Drive has trouble writing.
5. The diskette-switched circuit malfunctions.

A troubleshooting procedure for each of the above failure mode follows.

System Will Not Boot

It is possible for an analog card to be damaged in such a way that when it is connected to the external drive it keeps the internal drive from booting normally. To test for this condition:

1. Place the analog card to be tested on the external drive mechanical assembly, and connect the cables from the stepper motor, the read/write head, and connect the drive to the computer.
2. Place the *Apple II Emulation* diskette in the internal drive and turn on the power to the computer. The Emulation display will appear on the video screen. If the diskette does not boot, turn off the power to the computer and replace the following devices one at a time, repeating this step after each replacement until the diskette boots.

IC at C4 (labelled 2003)
IC at G2 (labelled 74LS125)
IC at A3 (labelled CA3146)
IC at B1 (labelled 3470)
IC at E2 (labelled 74LS74)

If the emulation diskette still fails to boot, place all original ICs in their sockets, and return the analog card to Apple.

**Drive Will Not
Read or Write**

If the emulation diskette boots successfully in the internal drive, perform the following steps:

1. Run the DSPEED test from the *Apple 5.25-Inch Disk Drive Diagnostic*. For instructions on setting up and running the diagnostic, refer to the "5.25-Inch Disk Drive Diagnostic" section in *Disk Drives Technical Procedures*.
2. Locate the DSPEED adjustment screw on the motor control board at the right rear of the mechanical assembly. Adjust this potentiometer while observing the drive speed indicator on the video display. If the value changes and the arrow moves as you turn the adjustment, this portion of the circuit is functional; proceed to the "Drive Has Trouble Reading" procedure. If the drive speed indicator does **not** move to reflect the speed adjustment, this circuit is faulty; turn off the power to the computer and replace the following devices (except those which have been replaced previously), one at a time, repeating this test after each device until the indicator moves reflecting the speed changes (then proceed to the DSPEED adjustment, Section 3, to adjust the motor speed to specification):

IC at B1 (labelled 3470)
 IC at A3 (labelled 3146)
 IC at G4 (labelled 74LS125)
 IC at C4 (labelled 2003)
 IC at E2 (labelled 74LS74)
 IC at F1 (labelled 74LS32)

If you replace all of the ICs on the analog card and the DSPEED indicator still fails to move, place all original ICs in their sockets and return the card to Apple.

**Drive Has
Trouble Reading**

If the drive will perform the DSPEED test successfully, perform the following steps:

1. Boot the *Apple II Emulation* diskette in the internal drive.
2. Once the Apple II Emulation menu appears on the screen, complete the boot process by placing the *DOS 3.3 System Master* diskette in the internal drive and pressing <Return>.

3. Move the DOS 3.3 diskette to the external drive.
4. Type CATALOG.D2, press <Return>, and watch the external drive for activity. The video screen should display the catalog of the *DOS 3.3 System Master* diskette. If this does not occur, replace the following devices according to the observed symptoms:

<u>Symptom</u>	<u>IC</u>	<u>Location</u>
In-Use light off	74LS32	F1
" "	74LS125	G2
" "	2003	C4
" "	74LS74	E2
Motor off,		
In-Use LED on	74LS32	F1
Head does not move	2003	C4
Head moves erratically	2003	C4
Recalibrates repeatedly	3470	B1
I/O ERROR message	3470	B1
" "	3146	A3
" "	74LS125	G2
" "	2003	C4
" "	74LS32	F1
" "	74LS74	E2

If you have replaced all of the ICs on the analog card and the catalog still does not appear on the monitor, place all original ICs in their sockets and return the card to Apple.

**Drive Has
Trouble Writing**

If the analog card correctly displays the catalog of the external drive, perform the following steps:

1. Type CATALOG.D2 and press <Return>. The catalog will be displayed on the video screen. Files displayed with an asterisk (*) preceding the filename are locked and may not be deleted. Note that filename **HELLO** is preceded by an asterisk.
2. Type UNLOCK HELLO and press <Return>.

3. Type CATALOG and press <Return>. The catalog will be displayed on the video screen. Verify that filename **HELLO** is not preceded by an asterisk. If you encounter trouble when attempting to unlock the file, turn off the power to the computer and replace the following devices (except those which have been replaced previously), one at a time, repeating this test after each device until the UNLOCK command executes successfully:

<u>Symptom</u>	<u>IC</u>	<u>Location</u>
I/O ERROR message	3470	B1
" "	3146	A3
WRITE PROTECTED error message	74LS125	G2
" "	74LS74	E2
Drive recalibrates repeatedly	3470	B1

4. Type LOCK HELLO and press <Return> to re-lock the file.

If you have replaced all of the ICs on the analog card and you still experience trouble writing to the drive, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next procedure.

**Write Protect
Circuit Malfunctions**

If the write-protect circuit malfunctions:

1. Place a write-protect tab on the *DOS 3.3 System Master* diskette and insert the diskette in the external drive.
2. Repeat steps 2 and 3 above (in the "Drive Has Trouble Writing" procedure). The video screen should display the **WRITE PROTECTED** error message. If this does not occur, replace the following device (unless it has been replaced previously) according to the symptom listed, and repeat this test.

<u>Symptom</u>	<u>IC</u>	<u>Location</u>
File remains locked	74LS125	G2
" "	74LS74	E2
I/O ERROR message	74LS125	G2
" "	74LS74	E2
" "	74LS32	F1

If the screen still does not display the **WRITE PROTECTED** message, place all original ICs in their sockets and return the analog card to Apple.

Diskette-Switched Circuit Malfunctions

The diskette-switched circuit detects the changing of the diskette. Due to the difference in the way the computer reads the directory in Apple II-emulation mode, this circuit must be tested in Apple II-emulation mode as well as in Apple III mode.

1. Boot the *Apple Business Basic* diskette in the internal drive and then move it to the external drive.
2. Type CATALOG .D2 and press <Return>. The disk catalog will display on the video screen.
3. Rest the eraser end of a common pencil lightly on the cam of the external drive mechanism and hold it there while carefully observing it. Type CATALOG .D2 again and press <Return>. Watch the drive cam for movement; you should **not** feel the pencil move. If the cam does move, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next step.

IC at E2 (labelled 74LS74)
IC at F1 (labelled 74LS32)

4. Remove the diskette from the external drive and re-insert it.
5. With the pencil eraser resting on the drive cam, type CATALOG .D2 and press <Return> and observe the cam for movement; you **should** feel the pencil move. If the cam does not move, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next step.

IC at E2 (labelled 74LS74)
IC at F1 (labelled 74LS32)

6. Repeat step 5 (above). This time, the cam should **not** move. If the cam moves, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next step.

IC at E2 (labelled 74LS74)

IC at F1 (labelled 74LS32)

7. Boot the *Apple II Emulation* diskette by placing it in the internal drive and turning on the power to the computer. The Emulation display will show on the video screen.
8. Remove the *Apple II Emulation* diskette and boot the *DOS 3.3 System Master* diskette by inserting it in the internal drive and pressing <Return>. Once it has booted, move it to the external drive.
9. Type CATALOG.D2 and press <Return>. After the catalog is displayed, press <Return>. the Applesoft prompt (]) will appear on the video screen.
10. Place the pencil eraser on the drive cam. Type CATALOG again and press <Return>. The cam should **not** move. If the cam moves, replace the following devices (unless they have been replaced previously) one at a time and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.

IC at E2 (labelled 74LS74)

IC at F1 (labelled 74LS32)

11. Remove the *DOS 3.3 System Master* diskette from the external drive and replace it in the same drive. Repeat step 10 (above) and check that the cam does **not** move. If the cam moves, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.

IC at E2 (labelled 74LS74)

IC at F1 (labelled 74LS32)

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Section 3 – Adjustments

☐ CONTENTS

- 3.3 Introduction
- 3.3 DSPEED
- 3.3 Making the Adjustment
- 3.4 Write-Protect Switch
- 3.4 Making the Adjustment

Note: If a step is underlined, detailed instructions for that step can be found in Section 1, Take-Apart.

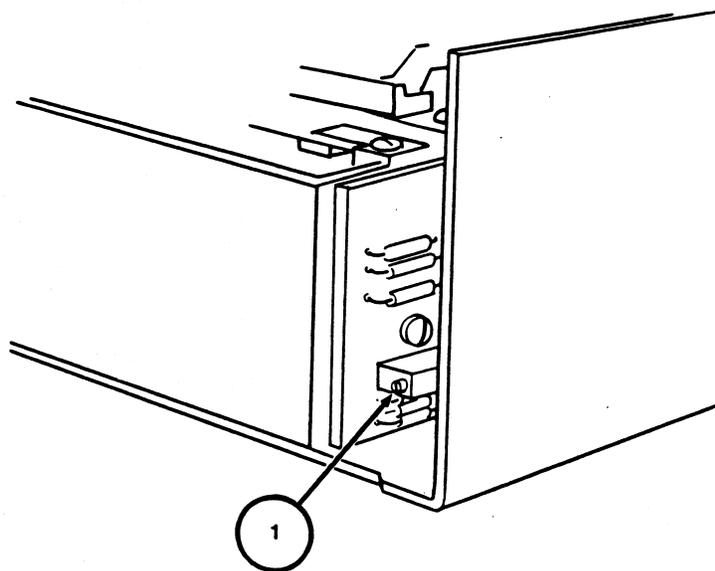


FIGURE 1

□ INTRODUCTION

These adjustment procedures were written to be used with the *Apple 5.25-Inch Disk Drive Diagnostic*—if the test indicates that you need to adjust the drive speed or if the write-protect test fails. All information on setting up and running the diagnostic is in the *Disk Drives Technical Procedures*, Section 1, 5.25-Inch Disk Drive Diagnostic.

□ DSPEED

Materials Required

Apple 5.25-Inch Disk Drive Diagnostic diskette
Disk Drives Technical Procedures manual
A small (jeweler's) flatblade screwdriver
Apple III with video display
The Disk III to be adjusted

Making the Adjustment

To adjust the DSPEED (drive motor speed):

1. Remove the case and shield.
 2. Start the diagnostic running (see the *Disk Drives Technical Procedures*, Section 1, 5.25-Inch Disk Drive Diagnostic). The diagnostic should be placed in the external drive after it has been loaded from the internal drive.
 3. Look at the back of the drive mechanism. Locate the motor control card, mounted on the rear, and locate the potentiometer which has a screwdriver adjustment on the side (Figure 1, #1). (Do not confuse this with the potentiometer(s) on the analog card!)
- Note:** When you make the DSPEED adjustment, keep the disk drive flat.
4. The adjustment is extremely sensitive, so turn the adjustment screw very slowly. The drive motor speed indicator on the screen will move back and forth, showing changes of the speed.

5. Adjust the speed so that it stays within the "good" range, as close to 0 as possible. Let the test run for 30 seconds.
6. Press <Escape> to return to the main menu; then repeat the test.

Does the DSPEED now stay within the "good" range?

- Yes—Press <Escape> to return to the main menu.
 - No—If the DSPEED cannot be properly adjusted, return the faulty mechanical assembly to Apple.
7. Remove the Diagnostic diskette from the drive.
 8. Replace the shield and case.

WRITE-PROTECT SWITCH

Materials Required

Scratch diskette
Small flatblade screwdriver

Making the Adjustment

To adjust the write-protect switch:

1. Remove the case.
2. Start the diagnostic running (see the *Disk Drives Technical Procedures*, Section 1, 5.25-Inch Disk Drive Diagnostic), and run the "Write Protect" test.
3. Note the two setscrews holding the write-protect switch in place (Figure 2, #1 & 2). The switch is located on the front left side of the drive as you face the drive door. The far setscrew (Figure 2, #1) forms a pivot for the switch; the near setscrew (Figure 2, #2) sets the switch position.

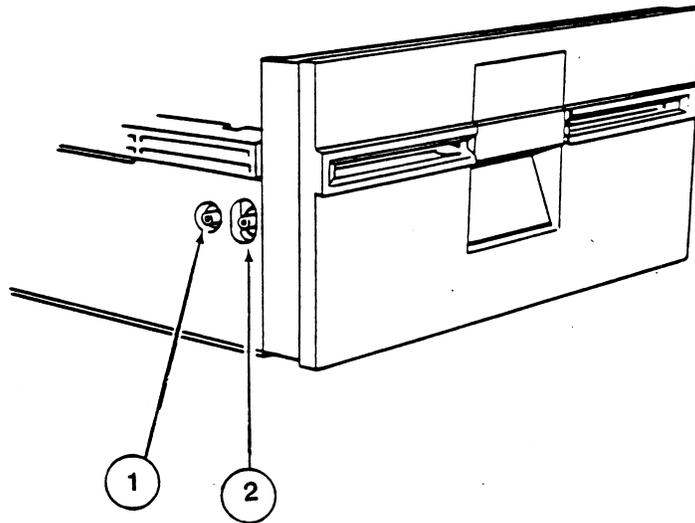


FIGURE 2

4. Insert the scratch diskette all the way and leave the disk drive door open.
5. Loosen the rear setscrew. Then loosen the front setscrew (Figure 2, #2), raise up on it until the switch disables, and tighten the setscrew.
6. Tighten the rear setscrew (Figure 2, #1).
7. Check the adjustment again by withdrawing the diskette approximately one-inch. The switch should be enabled.

Note: If the switch continues to show a disabled condition, reboot and try the procedure again.

8. Verify the adjustment again by pushing the diskette fully into the disk drive and then withdrawing it approximately one inch. The condition should change from disabled to enabled.

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Section 4 – Preventive Maintenance

☐ CONTENTS

4.2	Introduction
4.2	Read/Write Head
4.3	Head Load Button
4.3	Motor Drive Belt

Note: If a step is underlined, detailed instructions for that step can be found in Section 1, Take-Apart.

□ INTRODUCTION

The read/write head should be cleaned any time the computer or disk drive is being serviced. The head load button should be replaced whenever it is worn or dirty. The drive motor belt should be inspected any time the disk drive is being serviced.

□ READ/WRITE HEAD

Materials Required

#2 Phillips screwdriver
Cotton swabs
Isopropyl Alcohol (80% alcohol/20% water)

Procedure

To check the read/write head:

1. Remove the case, shield, and analog card.
2. Clean the guide rails with the isopropyl alcohol. **Do not** use grease.
3. Inspect the head for worn or dull spots in the ceramic. If you find any, replace the mechanical assembly.
4. Clean the head with the isopropyl alcohol.
5. Move the read/write head assembly back and fourth along the full length of its travel. Check for any blockage or friction. If there is any, replace the mechanical assembly.
6. Replace the analog card, shield, and case.

□ HEAD LOAD BUTTON

Materials Required

#2 Phillips screwdriver
Needlenose pliers
Head load button

Procedure

To service the head load button:

1. Remove the case, the analog card, and the mechanical assembly.
2. Lift up the Head Load Arm. If the head load button is worn or dirty, squeeze the top part of the load button with thin needlenose pliers, and drop the button down.

Note: Some head load buttons are glued. If the glue cannot be broken, send the mechanical assembly to Apple for servicing.

3. Install a new load button by inserting it into the holder and pushing up until it snaps into place.

□ MOTOR DRIVE BELT

Materials Required #2 Phillips screwdriver
Motor drive belt

- Procedure**
1. Remove the case.
 2. Turn the drive upside down. Locate the motor drive belt and check it for cracks, slippage, and elasticity. If the belt is dry or cracked, or if it slips, continue with step 3.
 3. Slip the belt off the pulley.
 4. Place the belt around the motor spindle and then slip it around the pulley.
 5. Replace the case.

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Section 5 – Illustrated Parts List

CONTENTS

- 5.3 Complete Assembly (Figure 1)
- 5.5 Internal Parts (Figure 2)
- 5.7 Analog Card (Figure 3)

The figures and lists in this section include all piece parts that can be purchased separately from Apple for the Disk III, along with their part numbers. These are the only parts available from Apple. Refer to your *Apple Service Programs Manual* for prices.

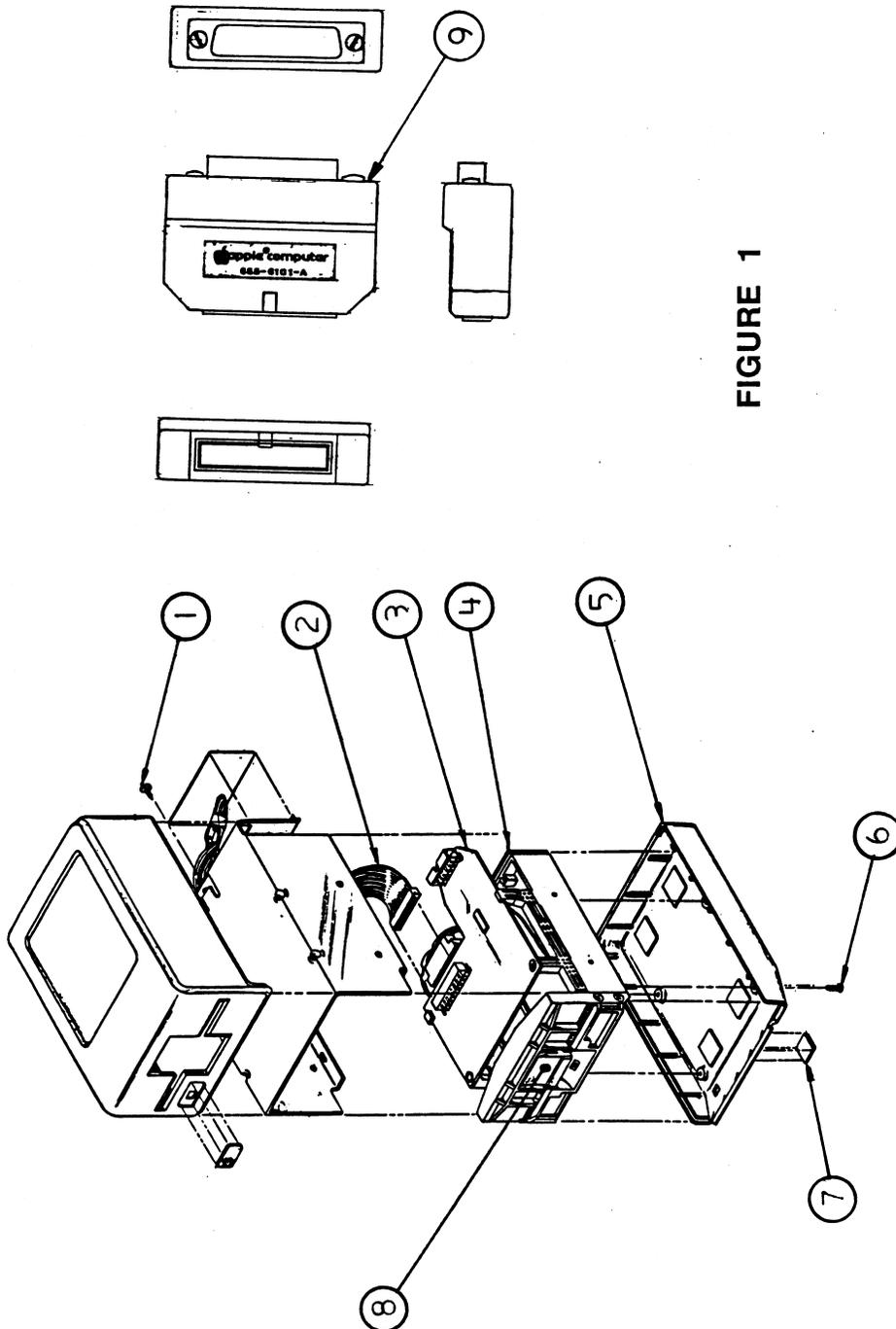


FIGURE 1

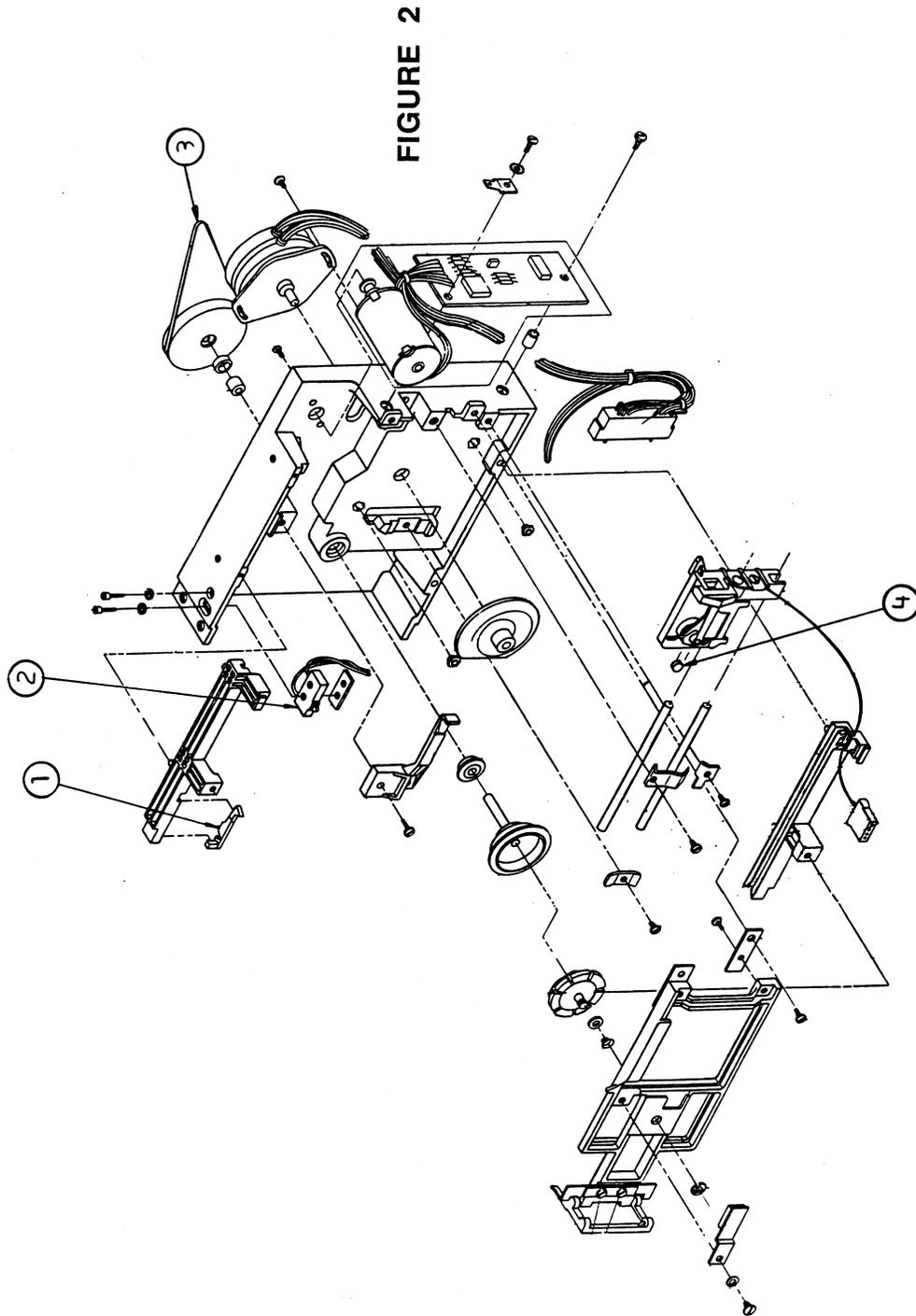
□ DISK III – COMPLETE ASSEMBLY (Figure 1)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	430-1001	Screw, Tapping, 8 x 18.437, Disk III
2	590-0024	Disk III Cable
3	661-92002	Disk III Analog Card
4	661-92015	Disk III Mechanical Assembly, External
5	815-0186	Disk III Bottom Cover
6	400-1606	Screw, 6-32 x 3/8, Disk III
7	865-0001	Rubber Foot
8	815-0187	Disk III Door
9	655-6101	PCB Adapter Assembly, Disk III/Apple III Plus

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Illustrated Parts List / 5.3



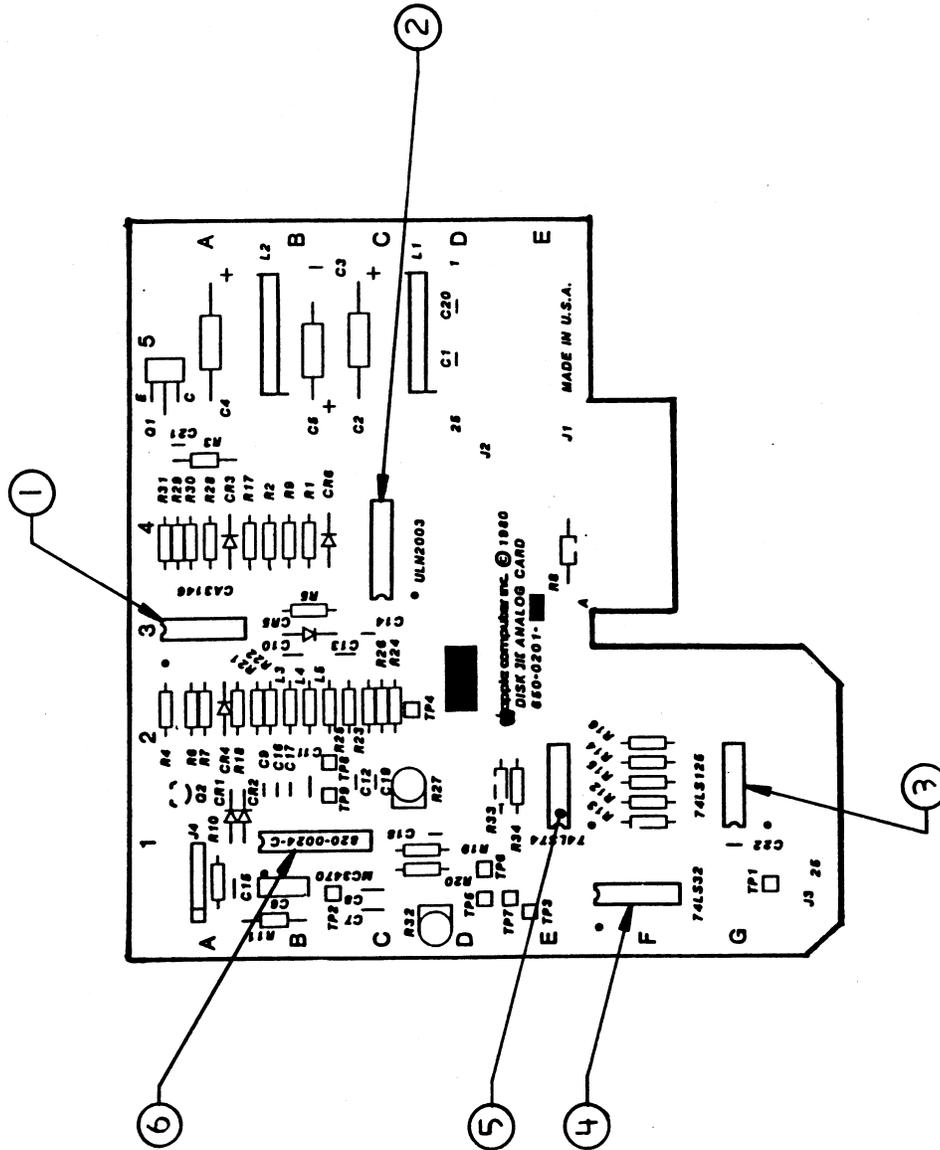
□ DISK III – INTERNAL PARTS (Figure 2)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	815-0377	Write Protect Actuator (Alps)
	U815-0073	Write Protect Actuator (Shugart)
2	U705-0005	Write Protect Switch, Disk II/III
3	U880-0002	Disk Drive Belt
4	U815-0064	Load Button

Disk III

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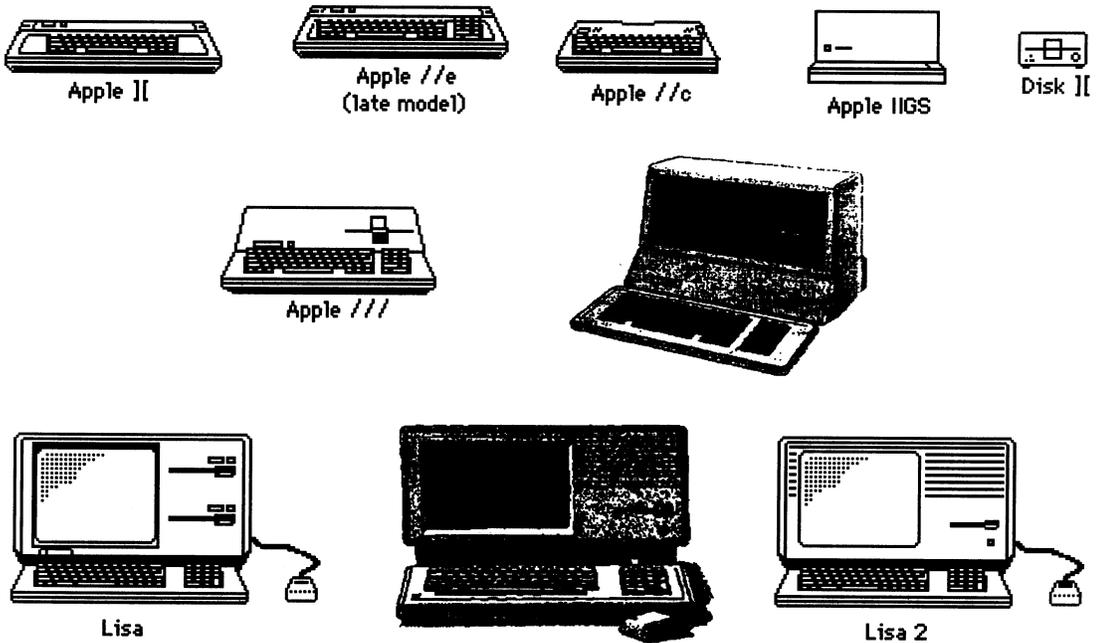
5.6 / Illustrated Parts List

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Disk III

□ **DISK III – ANALOG CARD (Figure 3)**

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	352-3146	IC 3146
2	327-2003	IC 2003A
3	306-0125	IC 74LS125
4	305-0032	IC 74LS32
5	305-0074	IC 74LS74
6	355-3470	IC MC3470



**End of Apple Service
Repair Information**

