



# **AppleService Technical Procedures**

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## **Apple Disk II**

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# Disk II

## Technical Procedures

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# Disk II

## Section 1 – Take-Apart

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### ☐ CONTENTS

- 1.3 Cover
- 1.4 Disk Drive Cable
- 1.4 Analog Card

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

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## □ COVER

### Materials Required

#2 Phillips screwdriver

### Remove

1. Turn the drive upside down and remove the four Phillips screws.
2. Set the door end of the unit down on a protective pad.
3. Slide the cover up until it clears the interior parts of the drive. Set the cover aside and set the unit down on its base again.

**Note:** If the vent covers (inside the housing) get caught on the frame while you are removing the cover, gently pry them away from the frame while continuing removal. After removal, smooth out any tear or bubble in the covers.

### Replace

1. Set the door end of the unit down on a protective pad.
2. Slide the cover down over the drive.
3. Turn the drive upside down and replace the four screws.

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## DISK DRIVE CABLE

**Materials Required**                    #2 Phillips screwdriver

### **Remove**

1. Remove the cover.
2. Release the catch on the nylon cable holder (mounted on the inside of the back plate) by pressing the tab toward the back of the unit.
3. Disconnect the cable from the analog card and lift the cable free of the drive.

### **Replace**

1. Place the cable into the nylon cable holder so that the toroids (donut-shaped ferrite pieces) are just below the cable holder, and snap the holder shut.
2. Attach the ribbon cable plug to the connector on the analog card, making sure that both rows of pins align with the holes in the plug and that the arrow on the plug points to pin 1 on the connector. (The cable should exit away from the analog card.)
3. Replace the cover.

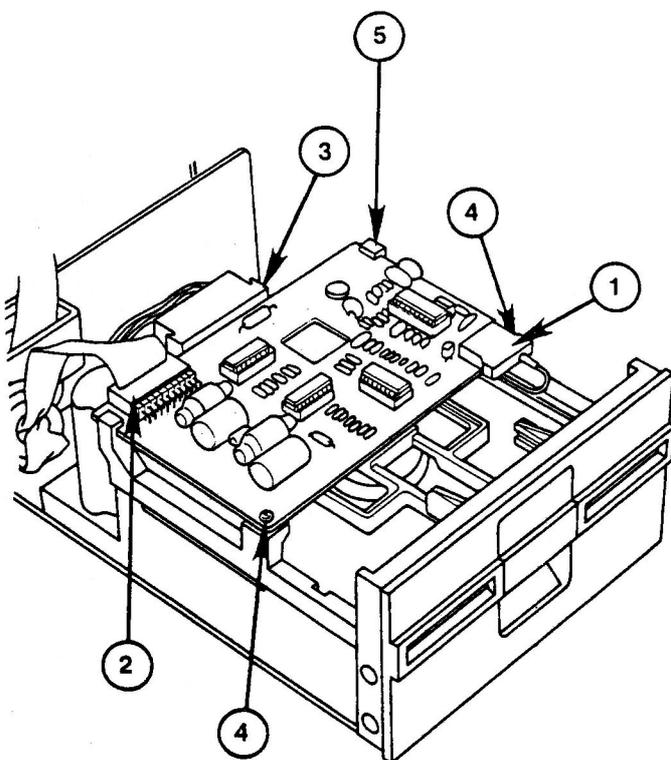
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## ANALOG CARD

**Materials Required**                    #2 Phillips screwdriver

### **Remove**

1. Remove the cover.
2. Gently disconnect the read/write head connector from the front of the analog card (Figure 1, #1).
3. Disconnect the ribbon cable from the rear of the card (Figure 1, #2).
4. Disconnect the motor connector from the rear of the card (Figure 1, #3).



**FIGURE 1**

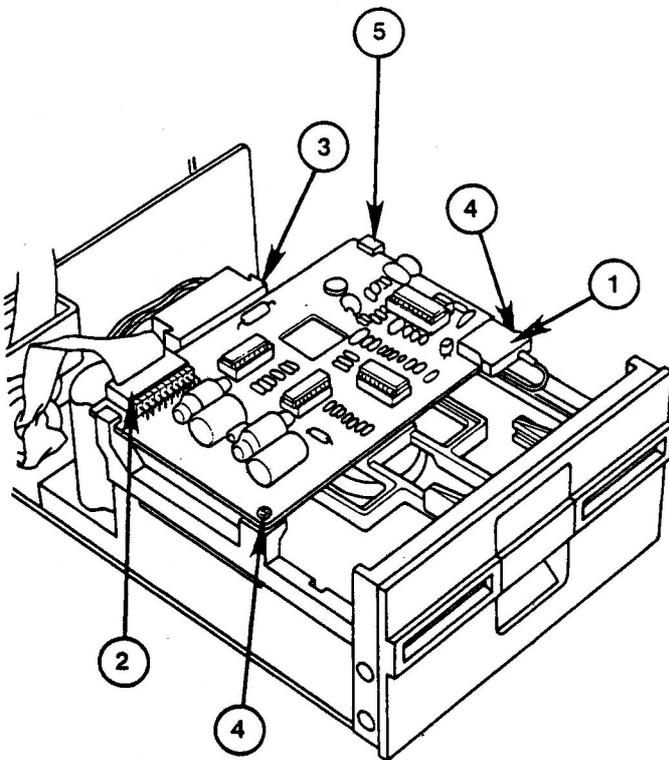
5. Remove the two screws at the front of the analog card (Figure 1, #4).

**Note:** These screws may have either standard or metric threads. To avoid intermixing, keep the screws with the disk drive they were taken from.

6. Slide the card forward past the retaining slots at the rear (Figure 1, #5), and then lift it out.

## Replace

1. Slide the card into position in the retaining slots of the rear support posts (Figure 1, #5).
2. Reinstall the two screws (Figure 1, #4) to hold the card in place.
3. Reconnect the read/write head connector (Figure 1, #1) to the card. Make sure that there is just enough loop in the cable so that it doesn't pull down on the head connector.
4. Reconnect the motor connector (Figure 1, #3) at the rear of the card.



**FIGURE 2**

5. Reconnect the ribbon cable connector (Figure 2, #2) at the rear of the card, making sure that both rows of pins align with holes in the connector.
6. Replace the cover.

# Disk II

## Section 2 – Troubleshooting

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2.2	General Information
2.2	How to Use the Symptom Chart
2.3	Symptom Chart
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2.4	Materials Required
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2.4	Visual Inspection
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2.6	Drive Will Not Read or Write
2.7	Drive Has Trouble Reading
2.7	Drive Has Trouble Writing
2.8	Write-Protect Circuit Malfunctions

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## □ INTRODUCTION

### General Information

These procedures provide guidelines for troubleshooting the Apple® Disk II® disk drive using the following tools:

- *Apple 5.25-Inch Disk Drive Diagnostic*
- Symptom/Corrective Action Chart

### How to Use the Symptom Chart

The *Symptom Chart* describes symptoms and appropriate steps to take to correct the failure.

When swapping out modules, remove the suspected faulty module and replace it with a known-good spare module. If the problem still occurs, remove the replacement module, re-install the original module in the Disk II, and try swapping out the next module on the list. Repeat the procedure until the problem no longer occurs. The module you replaced just before the problem disappeared is the faulty one. As a final check of the system, run the disk drive diagnostic.

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## □ SYMPTOM CHART

Symptom	Corrective Action
<ul style="list-style-type: none"><li>• <i>Drive comes on but will not boot. System gives I/O errors during normal operation.</i></li></ul>	<ol style="list-style-type: none"><li>1. Clean read/write head.</li><li>2. Adjust DSPEED.</li><li>3. Exchange interface cable.</li><li>4. Exchange analog card.</li><li>5. Exchange mechanical assembly.</li></ol>
<ul style="list-style-type: none"><li>• <i>Drive will not boot. Drive does not come on.</i></li></ul>	<ol style="list-style-type: none"><li>1. Exchange interface cable.</li><li>2. Exchange mechanical assembly.</li><li>3. Exchange analog card.</li></ol>
<ul style="list-style-type: none"><li>• <i>Drive makes high pitched whining sound.</i></li></ul>	<ul style="list-style-type: none"><li>– Exchange mechanical assembly.</li></ul>
<ul style="list-style-type: none"><li>• <i>Drive writes when diskette is protected.</i></li></ul>	<ol style="list-style-type: none"><li>1. Adjust write-protect switch.</li><li>2. Exchange analog card.</li><li>3. Exchange mechanical assembly.</li></ol>
<ul style="list-style-type: none"><li>• <i>Drive reads but does not write.</i></li></ul>	<ul style="list-style-type: none"><li>– Exchange analog card.</li></ul>

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## □ ANALOG CARD TROUBLESHOOTING

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

### Materials Required

Small flatblade screwdriver  
Apple II, II Plus, IIe or IIGS system  
Disk II (complete) with disk controller card  
Known-good Disk II mechanical assembly and interface cable  
Copy of *DOS 3.3 System Master* diskette (not write protected)  
Blank diskette  
Replacement ICs (one each):  
    74LS125  
    2003  
    3470  
    3146

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

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### System Setup

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

1. Place the analog card to be tested on the known-good mechanical assembly, and connect all cables so that this drive is drive 2 in the system.
2. Place the disk controller card in slot 6 of the computer.

### Visual Inspection

Examine the suspect analog card for visual signs of damage. This may take one of several forms:

1. Burned or melted ICs or sockets. Remove each of the four 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 four ICs may be physically damaged and in need of replacement. These cards should be returned to Apple for repair.

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

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## Symptoms

A malfunctioning analog card may manifest symptoms in one of five ways:

1. Drive 1 will not boot (with bad drive 2 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 write-protect switch circuit malfunctions.

A troubleshooting procedure for each type of failure follows.

### *System Will Not Boot*

An analog card can be damaged in such a way that when it is connected to drive 2, it keeps drive 1 from booting normally. To test for this condition:

1. Place the analog card to be tested on the drive 2 mechanical assembly and connect the cables from the stepper motor, the read/write head, and the disk controller.

2. Turn on the power to the computer. The DOS diskette should boot and display the Applesoft prompt ( ] ) on the 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 swap until the diskette boots.

IC at D4 (labelled 2003)  
IC at B4 (labelled 74LS125)  
IC at A3 (labelled CA3146)  
IC at B1 (labelled 3470)

If the DOS 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 DOS diskette boots successfully in drive 1, perform the following steps:

1. Turn off the power to the computer, remove the *DOS 3.3 System Master* diskette from drive 1 and insert the *Apple 5.25-Inch Disk Drive Diagnostic* diskette in drive 1. Turn the power on. The main menu will be displayed.
2. Refer to the *Disk Drives Technical Procedures*, Section 1, Apple 5.25-Inch Disk Drive Diagnostic, and run the DSPEED test.
3. Referring to Section 3, Adjustments, perform the DSPEED adjustment. 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.

IC at B1 (labelled 3470)  
IC at A3 (labelled 3146)  
IC at B4 (labelled 74LS125)  
IC at D4 (labelled 2003)

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 performed the DSPEED test successfully, perform the following steps:

1. Boot the *DOS 3.3 System Master* in drive 1, then remove it and place it in drive 2.
2. Type CATALOG,D2 and press <Return>. Watch drive 2 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>
Head does not move	2003	D4
Disk does not turn	2003	D4
Drive recalibrates repeatedly	3470	B1
I/O ERROR message	3470	B1
" "	3146	A3
" "	74LS125	B4
" "	2003	D4

If you have replaced all of the ICs on the analog card and the catalog still does not display, 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 drive 2, perform the following steps:

1. Boot the *DOS 3.3 System Master* diskette in drive 1, and then move it to drive 2.
2. 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 the filename **HELLO** is preceded by an asterisk.
3. Type UNLOCK HELLO and press <Return>.

4. Type CATALOG,D2 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:

IC at B4 (labelled 74LS125)

IC at D4 (labelled 2003)

IC at A3 (labelled 3146)

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

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

### *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 drive 2.
2. Repeat steps 2 and 3 above (under "Drive Has Trouble Writing"). The video screen should display **WRITE PROTECT ERROR**. If this does not occur, replace the 74LS125 at location B4 and repeat this test.

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

# Disk II

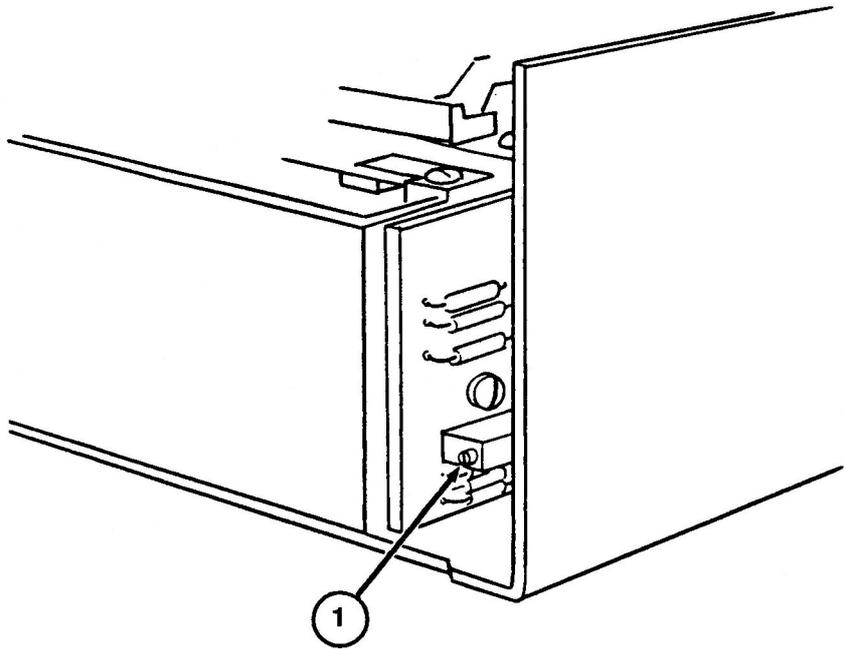
## Section 3 – Adjustments

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### ☐ CONTENTS

- 3.3 Introduction
- 3.3 DSPEED
- 3.4 Write-Protect Switch

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



**FIGURE 1**

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## □ 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.

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## □ DSPEED

### Materials Required

*Apple 5.25 Inch Disk Drive Diagnostic* diskette  
*Disk Drives Technical Procedures* manual  
A small (jeweler's) flatblade screwdriver  
Apple II, II Plus, IIe, or IIGs  
Known-good Disk II and interface card  
Disk II to be adjusted

### Making the Adjustment

To adjust the DSPEED (drive motor speed):

1. Remove the cover of the drive to be adjusted.
2. Run the DSPEED diagnostic (see the *Disk Drives Technical Procedures*, Section 1, 5.25-Inch Disk Drive Diagnostic). The diagnostic should be run from a known-good drive connected to the interface card as drive 1, and the drive to be adjusted should be connected as drive 2.
3. Look at the back of the drive mechanism. Locate the motor control board mounted on the edge, and locate the potentiometer that has a screwdriver adjustment on the side (Figure 1, #1). (Do not confuse this potentiometer with the potentiometers 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 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 cover.

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## WRITE-PROTECT SWITCH

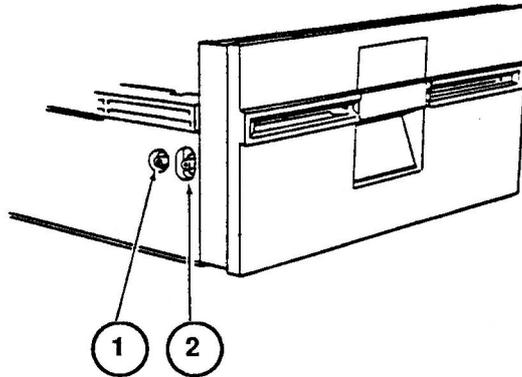
### Materials Required

Scratch diskette (not write protected)  
Small flatblade screwdriver

### Making the Adjustment

To adjust the write-protect switch:

1. Note the two setscrews holding the write-protect switch in place (Figure 2, #1 and #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**

2. Insert the scratch diskette all the way and leave the disk drive door open.
3. Loosen the rear setscrew. Then loosen the front setscrew, raise up on it until the switch disables, and tighten the setscrew.
4. Tighten the rear setscrew.
5. Check the adjustment 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.

6. 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.

# Disk II

## Section 4 – Preventive Maintenance

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### CONTENTS

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

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

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## □ 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 motor drive belt should be inspected any time the disk drive is being serviced.

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## □ READ/WRITE HEAD

### Materials Required

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

### Procedure

To service the read/write head:

1. Remove the case and analog board
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 forth 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 board and case.

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## □ HEAD LOAD BUTTON

### Materials Required

#2 Phillips screwdriver  
Needlenose pliers  
Head load button

### Procedure

To service the head load button:

1. Remove the case and analog board.
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 small needlenose pliers, and let the button drop down.

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

3. Insert the new load button into the head load arm. Press the button until it snaps into place.
4. Replace the analog board and case.

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## □ MOTOR DRIVE BELT

### Materials Required

#2 Phillips screwdriver  
Motor drive belt

### Procedure

To service the motor drive belt:

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 new belt around the motor spindle and then slip it around the pulley.
5. Replace the case.

# Disk II

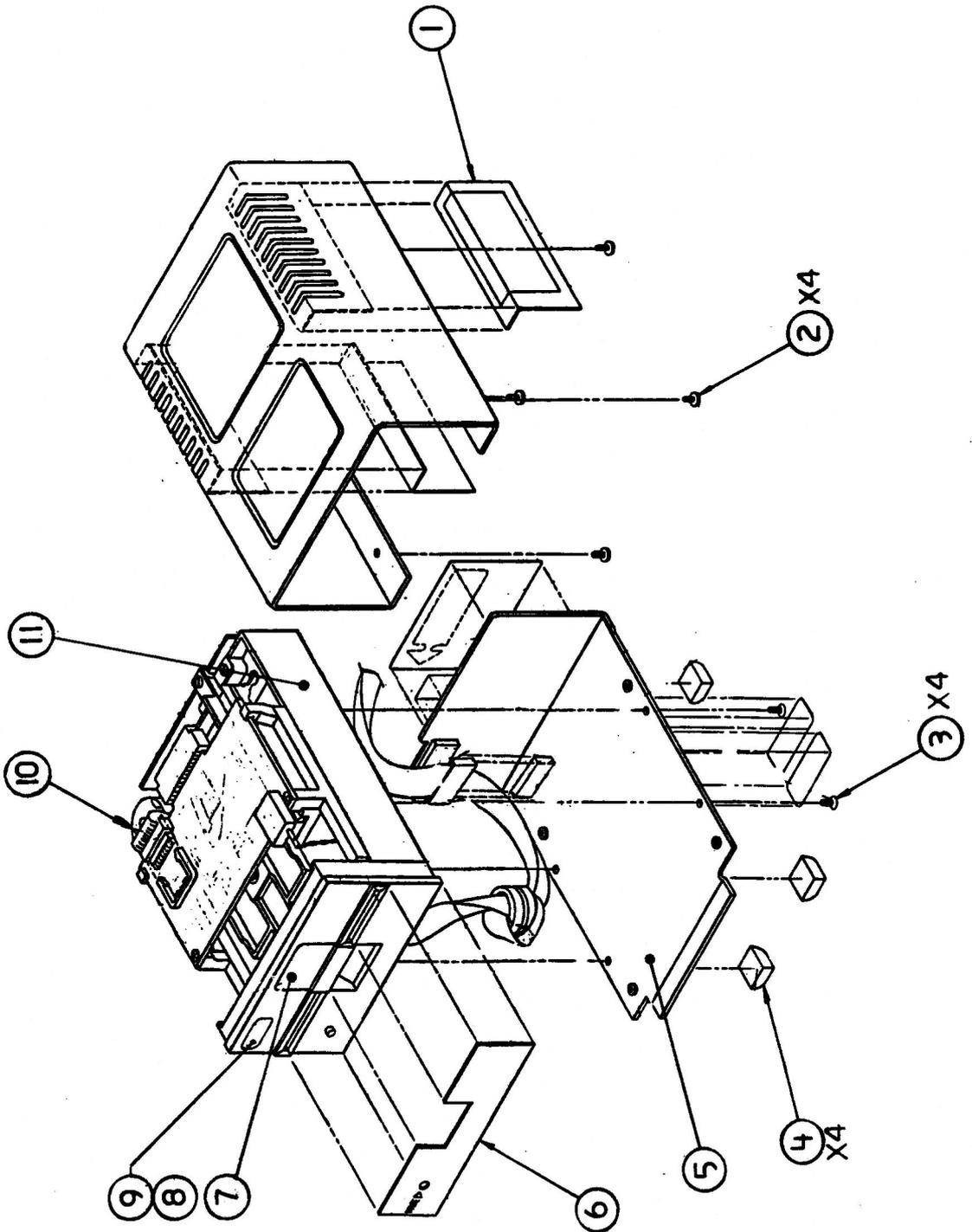
## Section 5 – Illustrated Parts List

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- 5.3 Finished Goods Assembly (Figure 1)
- 5.5 Internal Parts (Figure 2)
- 5.7 ICs (Figure 3)

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



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**□ DISK II – FINISHED GOODS ASSEMBLY (Figure 1)**

<b><u>Item</u></b>	<b><u>Part No.</u></b>	<b><u>Description</u></b>
1	825-0009	Cover, Case Slots, Disk II
2	403-1606	Screw, 6-32 x 3/8, DRPHD, Disk II
3	400-3604	Screw, 6-32 x 1/4, Pozi-Drive Flat Head, Disk II
4	865-0001	Rubber Feet
5	805-0005	Chassis Base, Disk II
6	825-0005	Disk II Front Name Plate Label
7	U815-0066	Door & Hinge Assembly
8	825-0011	Multiple Drive ID #1, Label
9	825-0012	Multiple Drive ID #2, Label
10	590-0031	Disk II Cable Assembly, 15" LG
11	661-92012	Disk II Mechanical Assembly

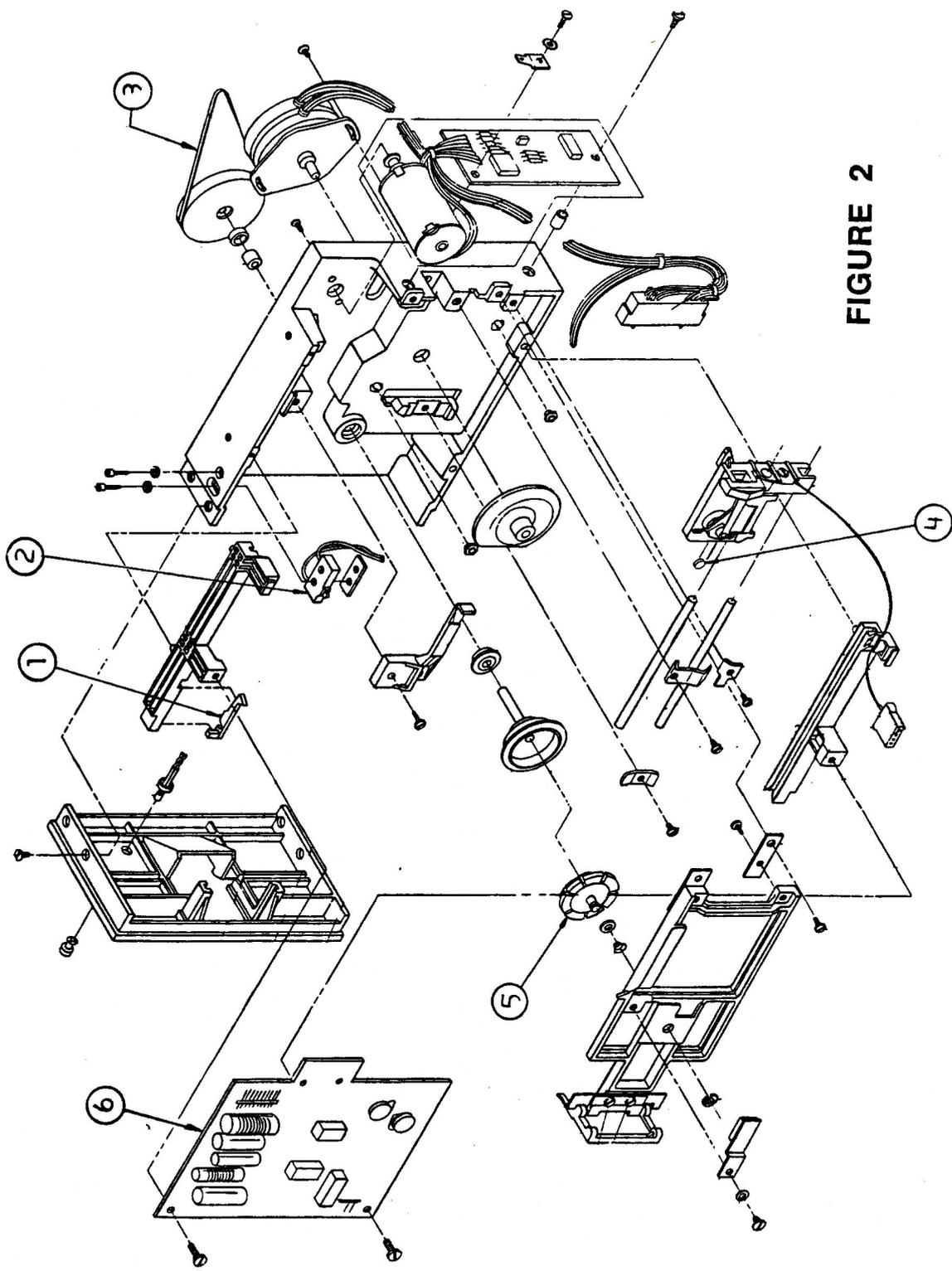
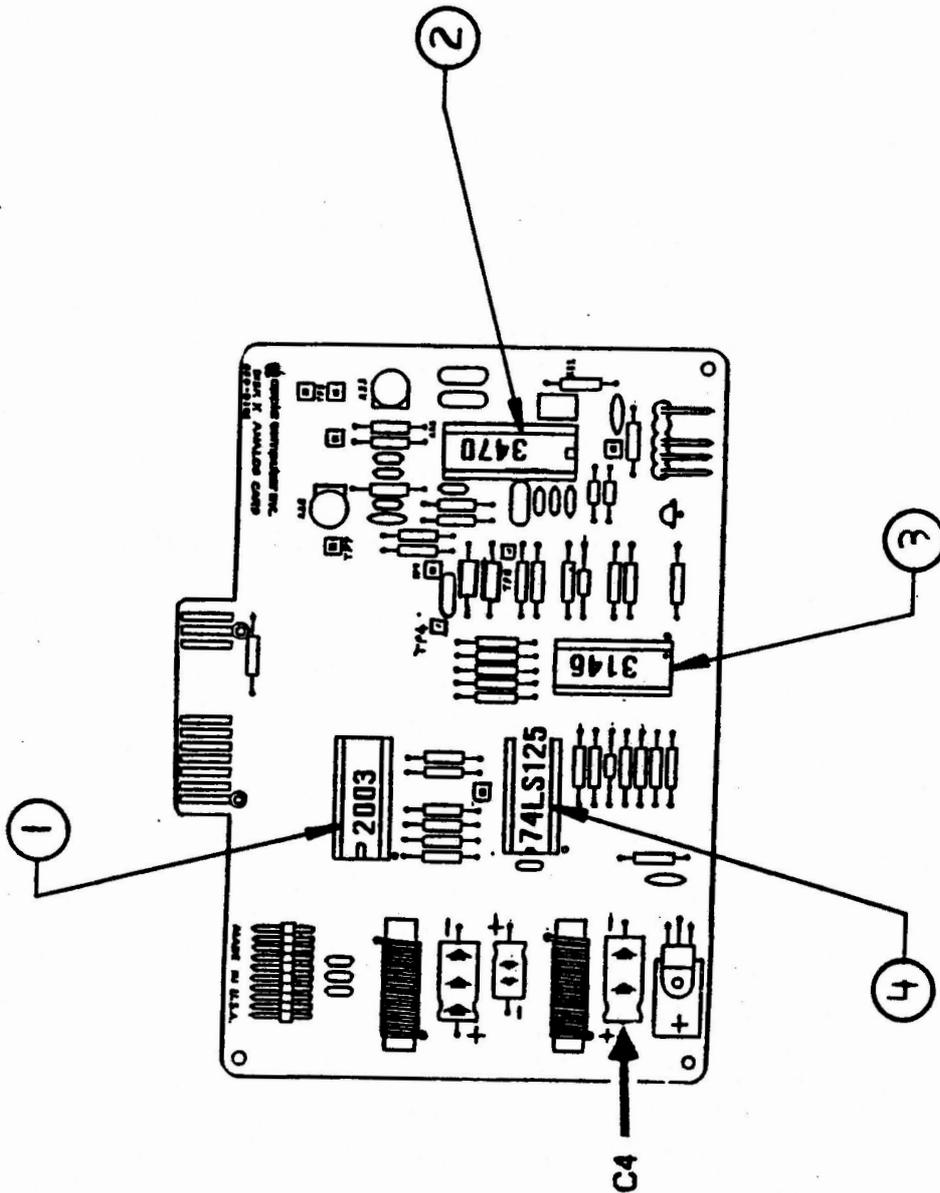


FIGURE 2

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**□ DISK II – 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 DII-III
3	U880-0002	Disk Drive Belt
4	U815-0064	Load Button
5	U815-0067	Disk II Collet Hub
6	661-92001	Disk II Analog Card



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**□ DISK II - ICs (Figure 3)**

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	327-2003	IC 2003A
2	355-3470	IC MC3470
3	351-3146	IC 3146
4	306-0125	IC 74LS125

