AppleService Technical Procedures

Apple DuoDisk

Apple Technical Procedures

DuoDisk

Technical Procedures

❑ TABLE OF CONTENTS

Apple Technical Procedures

DuoDisk

Section 1 – Basics

❑ CONTENTS

❑ PRODUCT DESCRIPTION

The Apple® DuoDisk® is effectively two disk drives in one case. Both drives are attached to a single analog card, with the drive on the left side defined as Drive 1.

There are four main modules that can be replaced: the interface card, the interface cable, the analog card, and the mechanical assembly. Chip swapping on the analog card is recommended before replacing the card.

Model Comparison

DuoDisk uses removable single-sided floppy disks to store and retrieve up to 143K of data per disk. The DuoDisk is compatible with any computer in the Apple II family, with the exception of the Apple IIc.

The contains the same drive mechanism as the Apple 5.25 Drive and UniDisk, but with a different sub-bezel.

Connecting the DuoDisk

The DuoDisk may be connected to a disk drive port (on an Apple IIGS™) or to a 5.25 Drive controller card installed in a peripheral slot (in an Apple II, II Plus, IIe, or IIGS). (The DuoDisk controller card is identical to the UniDisk™ or 5.25 Drive controller card.)

1. The controller card supports a maximum of one DuoDisk or two 5.25 drives. To add more drives, you must install a second 5.25 drive controller card. (You cannot plug a 3.5 drive into a 5.25 controller card, nor a DuoDisk into a 3.5 controller card.)

2. The disk drive port on the Apple IIGS will support a combination of up to four daisy chained 5.25 and 3.5 drives. A DuoDisk counts as *two* drives.

For installation instructions and daisy chain configurations, refer to the *DuoDisk Owner's Guide.*

Apple Technical Procedures

DuoDisk

Section 2 – Take-Apart

❑ CONTENTS

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

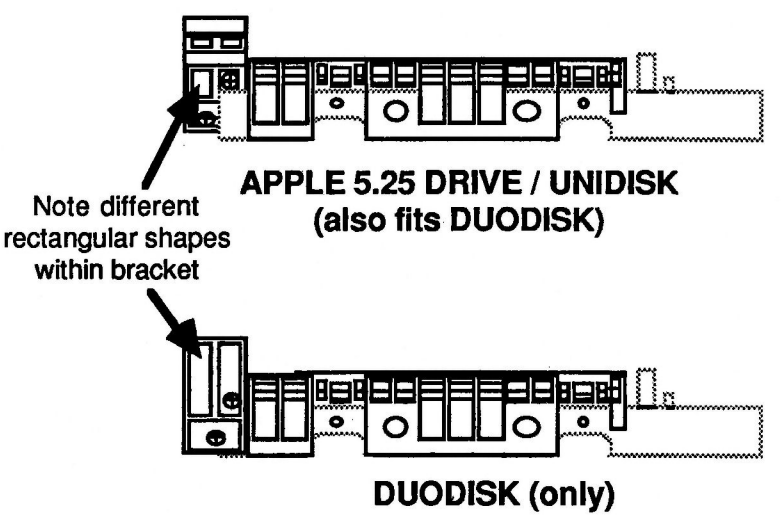
❑ INTRODUCTION – INTERCHANGEABLE PARTS

The same mechanical assembly is used in the DuoDisk, the UniDisk, and the Apple 5.25 Drive. However, the mechanical assembly service module may have either of two sub-bezels, shown in the figure below.

The sub-bezel designed for the Apple 5.25 Drive/ UniDisk is universal (that is, it will also fit in the DuoDisk), but the DuoDisk sub-bezel will not fit in the Apple 5.25 Drive or UniDisk. Therefore, if you receive a mechanical assembly with the DuoDisk sub-bezel and you wish to install the assembly in an Apple 5.25 Drive or UniDisk, you must swap the customer's sub-bezel with the DuoDisk sub-bezel before installation.

For all installations, be sure to swap the doors, if necessary, so that the colors are appropriate. The DuoDisk and UniDisk have beige doors. The Apple 5.25 Drive has a platinum door.

The procedures for replacement are given in "Sub-Bezel and Door" later in this Take-Apart section.



❑ COVER AND SHIELD

Materials Required

Medium Phillips screwdriver

Remove

To remove the top cover and shields:

1. Remove the two screws at the back of the unit, and remove the top cover.

2. Still facing the back of the unit, locate the right shield and remove the screw on the top. (This screw also secures one end of the ground strap.) Remove the right shield.

3. Now locate the left shield and remove the two screws that secure it to the chassis of the left drive.

4. Remove the screw that braces the left shield to the right drive, and remove the left shield.

Replace

To replace the shields and cover:

1. Position the DuoDisk with the back facing you.

2. Replace the metal shield on the left drive, fitting the front prongs into place. Make sure that the stepper motor cable on drive 2 fits through the semicircular cutout at the back of the shield.

3. Replace the two screws on the left drive shield and the one screw that fastens the left drive to the right drive.

4. Replace the shield on the right drive, and secure the shield and the ground strap with the top screw.

5. Slide the top cover into place, and replace the two screws at the back of the case.

❑ ANALOG BOARD

Remove

To remove the analog board:

1. Remove the top cover and right-drive shield.
2. Disconnect the read/write head cables (Figure 1, J1 and J2).

   Note: Always pull on the connector, not the wires.
3. Disconnect the stepper motor cables (Figure 1, J3 and J4). *Be sure to pull on the connector and not on the wire.*
4. Disconnect the LED cables (Figure 1, J6 and J7).
5. Remove the two screws, and slide the analog board out between the guides.

Replace

1. Lift the six connectors away from the mechanical assembly on the right drive, and position the analog board with the front through the guides.
2. Route the read/write head cables (Figure 1, J1) and stepper motor cables (Figure 1, J3) through their respective cutouts.
3. Secure the analog board with the two screws.
4. Reconnect the stepper motor cable (Figure 1, J3) for the right drive. If there is no key to indicate correct orientation, the side with "A2" should be face up. (There will be no wires for pins 1 and 2.)
5. Route the left-drive stepper motor cable through the cutout at the back of the shield, and connect it (Figure 1, J4).
6. Route the read/write head cable for the left drive through the cutouts, and connect it (Figure 1, J2). Make sure the shrink tubing fits in the cutouts.

   Note: The connector will fit on either way, so make sure that each pin of the fixture is aligned with a metal tab within the connector.

7. Reconnect the read/write head cable for drive 1 (Figure 1, J1).

8. Reconnect the LED cables for the left drive (Figure 1, J6) and for the right drive (Figure 1, J7).

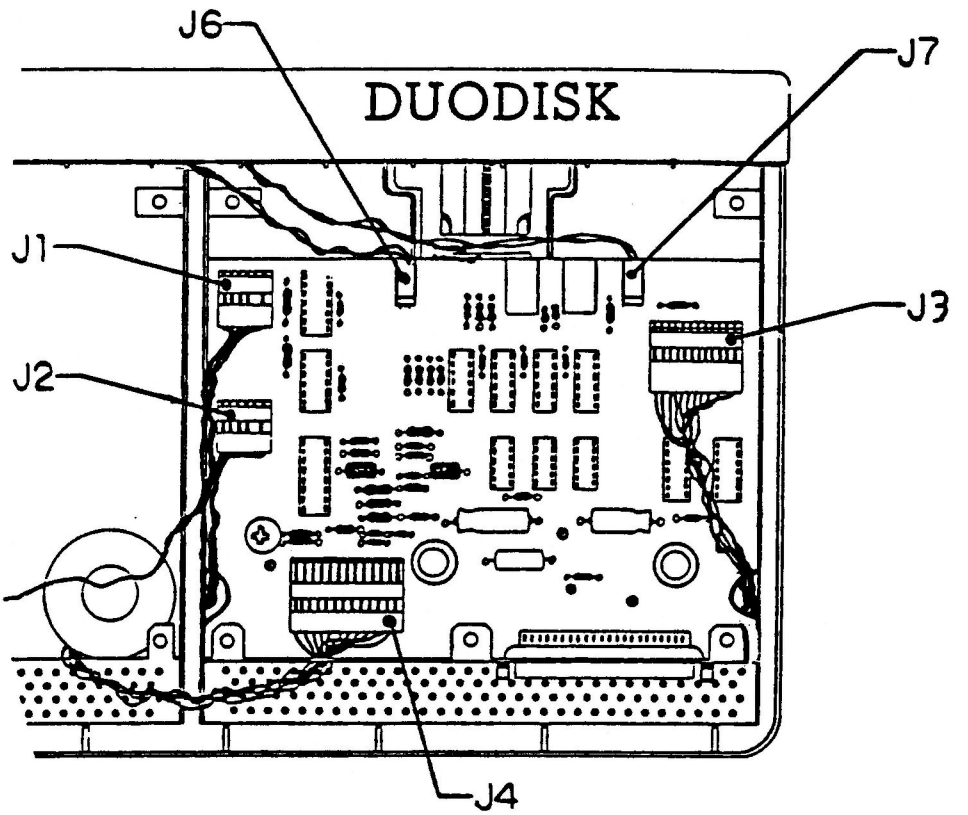


FIGURE 1

❑ MECHANICAL ASSEMBLY

If you are replacing a DuoDisk mechanical assembly with a UniDisk or 5.25 Drive mechanical assembly, see the Introduction at the beginning of this section.

Remove

To remove the mechanical assembly:

1. Remove the top cover, the shield, the cable, and the analog board.

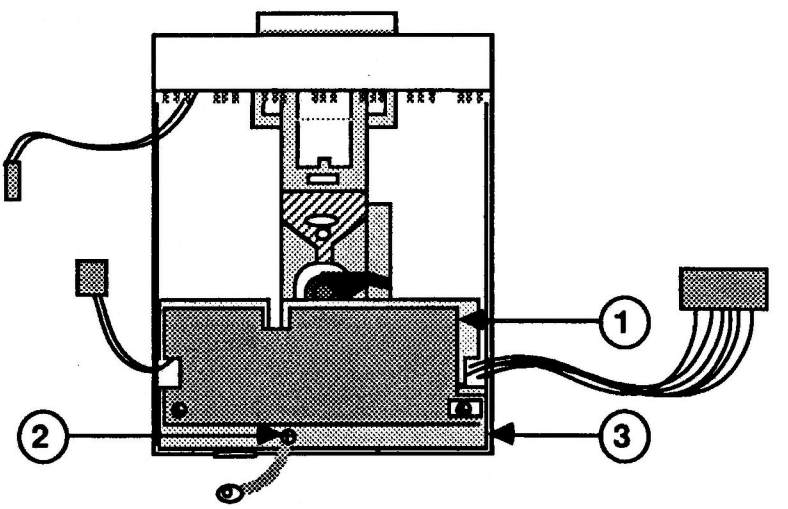


FIGURE 2

2. Remove the black insulation paper (Figure 2, #1).

3. Remove the Phillips screw (Figure 2, #2) that secures the ground strap to the chassis. Set the ground strap aside.

4. Lift off the metal shield (Figure 2, #3) and set it aside.

5. Turn the unit over and remove the four screws that secure the metal chassis to the plastic case.

6. Lift up on the back of the metal chassis, and slide it completely out of the case bottom.

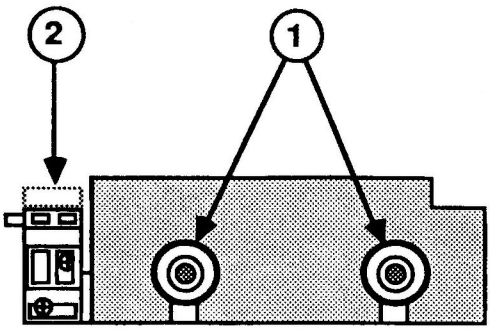


FIGURE 3

7. Orient the drive sideways, as shown in Figure 3, and remove the two Phillips screws (Figure 3, #1). Then turn the drive so that you face the other side, and remove those two screws.

8. Lift up on the sub-bezel (Figure 3, #2) and carefully slide the mechanical assembly out of its metal housing.

Replace

To replace the mechanical assembly:

1. Place the mechanical assembly back inside its metal housing.

2. Replace the Phillips screws (Figure 3, #1) on both sides of the drive to secure the mechanical assembly inside the metal housing.

3. Replace the metal shield (Figure 2, #3), routing the cables through the cutouts at the sides of the shield (see Figure 2).

4. Place the black insulation paper (Figure 2, #1) on the metal shield.

5. Replace the Phillips screw (Figure 2, #2) to secure one end of the ground strap to the chassis.

6. Close the door of the mechanical assembly.

7. Hold the LED cable out of the way while you carefully slide the mechanical assembly into the case bottom.

8. Replace the analog board, the cable, the shield, and the top cover.

❑ SUB-BEZEL AND DOOR

Remove

To remove the sub-bezel and door:

1. Remove the case top and shield, the cable, the analog board, and the mechanical assembly.

2. Remove the two Phillips screws at each side of the sub-bezel.

3. Slide the door and spring off the mechanical assembly.

Replace

To replace the sub-bezel and door:

1. Replace the door, making sure the side edges fit into the grooves on the metal carriage (Figure 4, #1) and the door springs fit over the supporting tabs (Figure 4, #2).

2. Replace the sub-bezel and its two Phillips screws.

   Note: A defective mechanical assembly must be returned to Apple with a sub-bezel attached.

3. Replace the case top and shield, the analog board, and the mechanical assembly.

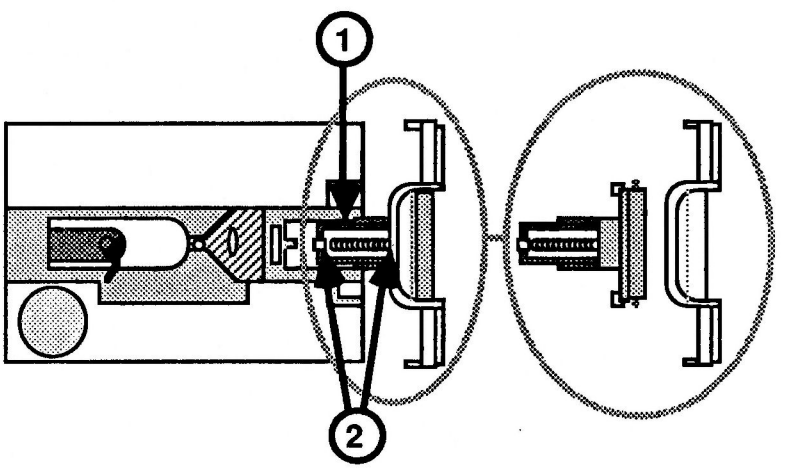


FIGURE 4

Apple Technical Procedures

DuoDisk

Section 3 – Adjustments

❑ CONTENTS

❑ DSPEED

This adjustment procedure was 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. All information on setting up and running the diagnostic is in the *Disk Drives Technical Procedures,* Section 1, 5.25-Inch Disk Drive Diagnostic.

Materials Required

Apple 5.25-Inch Disk Drive Diagnostic diskette
Disk Drives Technical Procedures
A small (jeweler's) flatblade screwdriver
Apple II, II Plus, IIe, or IIGS with video display
DuoDisk to be adjusted
DuoDisk interface card

Making the Adjustment

To adjust the DSPEED (drive speed):

1. The "working" drive should be connected to the analog card as drive 1, the drive to be adjusted connected as drive 2.

2. You should have the diagnostic running; if you do not, see the *Disk Drives Technical Procedures,* Section 1, 5.25-Inch Disk Drive Diagnostic.

3. Locate the DSPEED adjustment hole under the drive being tested. It is a small hole near the front of the drive. The adjustment screw is located inside the hole.

   Note: When you make the DSPEED adjustment, keep the DuoDisk 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 is 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 drive mechanism to Apple.

7. Remove the *Apple 5.25-Inch Disk Drive Diagnostic* diskette from the drive.

Apple Technical Procedures

DuoDisk

Section 4 – Troubleshooting

❑ CONTENTS

❑ INTRODUCTION

The Apple DuoDisk disk drive is effectively two disk drives in one case. Both drives are attached to a single analog card, with the drive on the left side defined as drive 1.

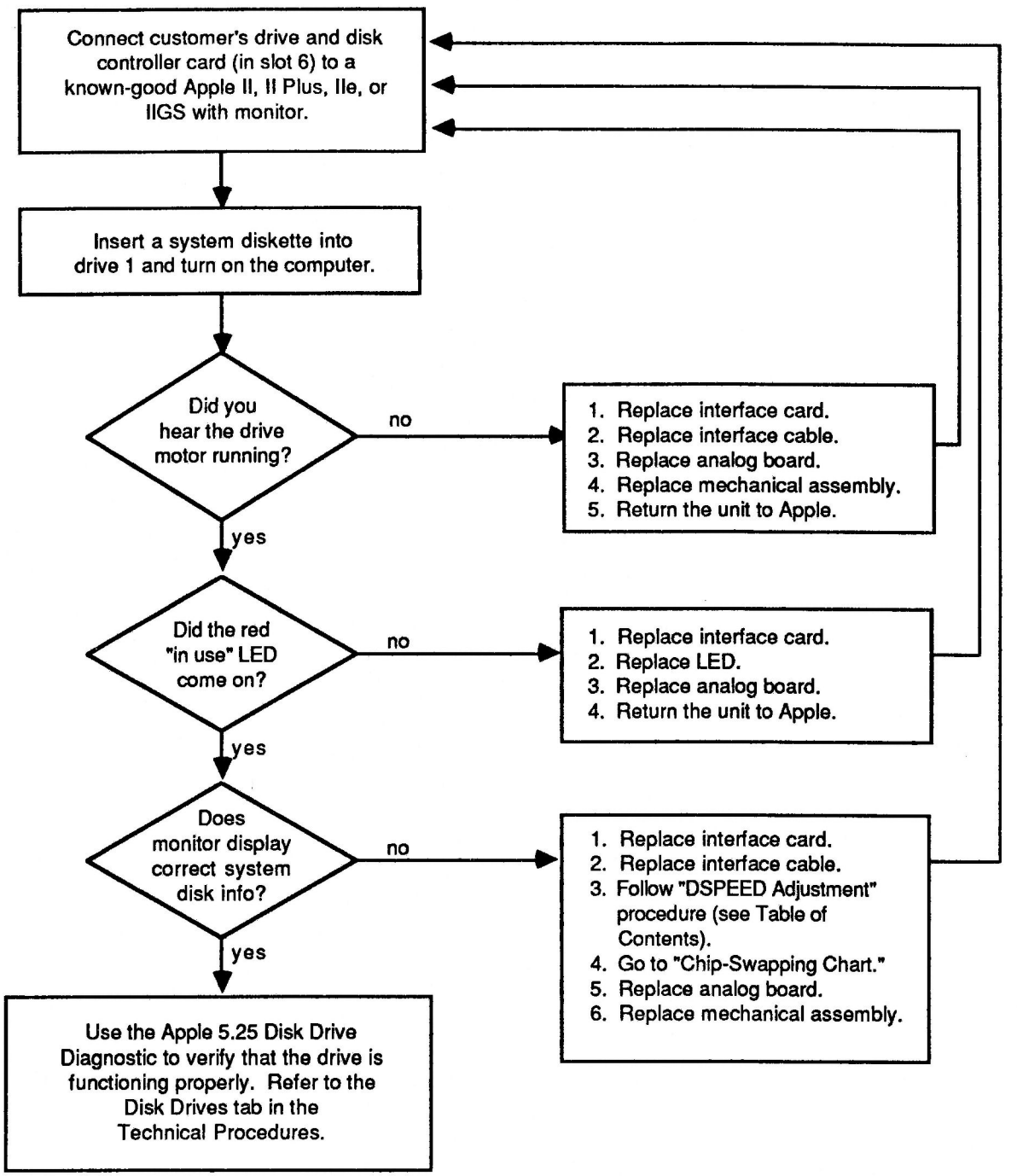
There are four main modules that can be replaced: the interface card, the interface cable, the analog card, and the mechanical assembly. Chip swapping on the analog card is recommended before replacing the card.

❑ USING THE TROUBLESHOOTING FLOWCHART

Whenever a customer brings in a malfunctioning DuoDisk, use the flowchart on the following page as a troubleshooting guide. Begin with the box at the upper left corner of the page. When you get to one of the answer boxes, swap the modules, one at a time, in the order in which they are listed. Each time you swap a module, go back to the beginning of the flowchart and try to boot a system diskette (preferably a *ProDOS System Master*).

Once you are able to boot the system diskette, run the *Apple 5.25-Inch Disk Drive Diagnostic* and perform any adjustments necessary. Reinstall the customer's modules, one at a time, and run the drive diagnostic after each exchange to isolate the bad modules.

TROUBLESHOOTING FLOWCHART



❑ ANALOG CARD VERSION IDENTIFICATION

Remove the DuoDisk cover and shield to access the analog card (see Section 3, Take-Apart).

There are three different versions of the analog card. Identify which card you have by the engineering number on the card (see Figure 1, #1 and Figure 2, #1). Figure 1 shows the layout of cards with engineering numbers 676-[ ]101 and 676-[ ]102. Figure 2 shows the layout of cards with engineering number 676-[ ]107.

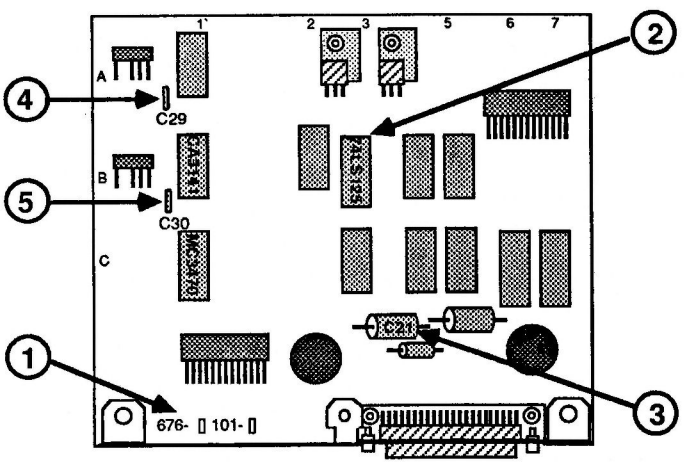


FIGURE 1

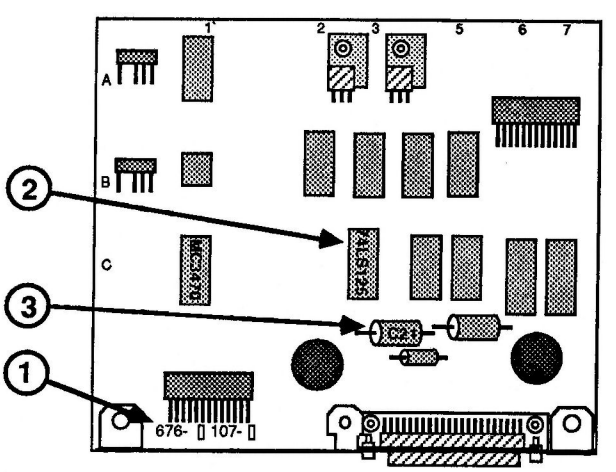


FIGURE 2

❑ DUODISK CAPACITOR FIX

It is possible for the DuoDisk to destroy data on the diskette. This destruction can occur when attempting the <Open-Apple><Control><Reset> technique for rebooting, or when using software with certain copy-protection schemes. If a unit exhibits this problem but passes the *Apple 5.25-Inch Disk Drive Diagnostic*, check the analog board. Analog boards with part numbers 676-[ ]101 and 676-[ ]102 may have this problem. The fix is to carefully identify and cut the two capacitors off the board. The capacitors, labeled C29 and C30, are in zones B1 and A1 (see Figure 1, #4 and #5 and the chip-swapping chart on the next page). Use small wire clippers or simply jiggle the capacitors to snap the connections.

❑ USING THE ANALOG CARD CHIP-SWAPPING CHART

The chip-swapping chart on the following page can be used for drive 1 or drive 2.

> ***Note:*** Before replacing any chips, carefully inspect the card for melted or broken components, particularly the 74LS125 (see Figure 1, #2, or Figure 2, #2) and C21 (see Figure 1, #3, or Figure 2, #3). If you notice fuzz on the card, return the card to Apple. The presence of fuzz usually means that the computer was on while the card was being installed and that capacitor C21 has exploded.

To use the chip-swapping chart, identify the symptom and replace the related chips, one at a time, in the order in which they are listed. Each time you replace a chip, turn the computer on to see if the problem is gone. If the problem still exists after you have replaced all the related chips, return to your place on the troubleshooting flowchart and continue with the next step in the box.

❑ ANALOG CARD CHIP-SWAPPING CHART

Symptom	Location	Defective Chip Type
• *Motor and LED on, but disk won't boot*	B1	CA3141*
	B3*	74LS125
	C3**	74LS125
	C1	MC3470
• *Drive reads but does not write*	B1	CA3141*
	B3	74LS125
• *Data on disk is damaged when using <Open-Apple><Control><Reset> **or** certain copy-protected software—**but** the unit (containing an analog card numbered 676-[ ]101 or 676-[ ]102) passes the Apple 5.25-Inch Disk Drive Diagnostic.*	A1	Capacitor C29*
	B1	Capacitor C30* (remove both; do not replace)

* Analog card engineering numbers 676-[ ]101 or 676-[ ]102 only.

** Analog card engineering number 676-[ ]107 only.

Apple Technical Procedures

DuoDisk

Section 5 – Preventive Maintenance

❑ CONTENTS

Note: If a step is underlined, detailed instructions for that step can be found in Section 2, 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 motor drive 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 service the read/write head:

1. Remove the top cover, drive shield, 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, drive shield, and top cover.

❑ HEAD LOAD BUTTON

Materials Required

#2 Phillips screwdriver
Needlenose pliers
Head load button

Procedure

To service the head load button:

1. Remove the top cover, drive shield, 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.

3. Insert the new load button into the head load arm. Press the button until it snaps into place.

5. Replace the analog board, drive shield, and top cover.

❑ MOTOR DRIVE BELT

Materials Required

#2 Phillips screwdriver
Motor drive belt

Procedure

To service the motor drive belt:

1. Remove the case, and the top and bottom shield.
2. Turn the drive upside down, and locate the motor dirve belt. Check the belt 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 top and bottom shield, and the case.

DuoDisk

Section 6 – Additional Procedures

❑ CONTENTS

❑ SPECIAL REPAIR PROCEDURES

Background

Some DuoDisks with serial numbers before 325000 have loose analog boards that may slip out of their guide tracks (the forward supports on the sides of the shield). This brings the analog board into contact with the disk mechanical assembly and may short-circuit the board.

Procedure

If you are repairing one of these drives:

1. Check the serial number of the DuoDisk: If it is below 325000, continue with this procedure.

2. Using needlenose pliers, bend the top of the shield inward about 1 mm, so that the guides hold the analog board firmly in place.

***WARNING:** Do not bend the shield too far, as any stress on the mechanical assembly may cause problems with head radial alignment.*

3. Run the *Apple 5.25-Inch Disk Drive Diagnostic*, to check for possible head radial alignment problems caused by stress on the mechanical assembly. If there is such a problem, bend the shield back until alignment problems no longer occur. If the drive continues to fail the diagnostic, send the drive back to Apple for repair.

4. Look through the disk drive door to make sure that the analog board is seated correctly. If the analog board still falls off its supports, repeat steps 2–4.

Apple Technical Procedures

DuoDisk

Illustrated Parts List

CONTENTS

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

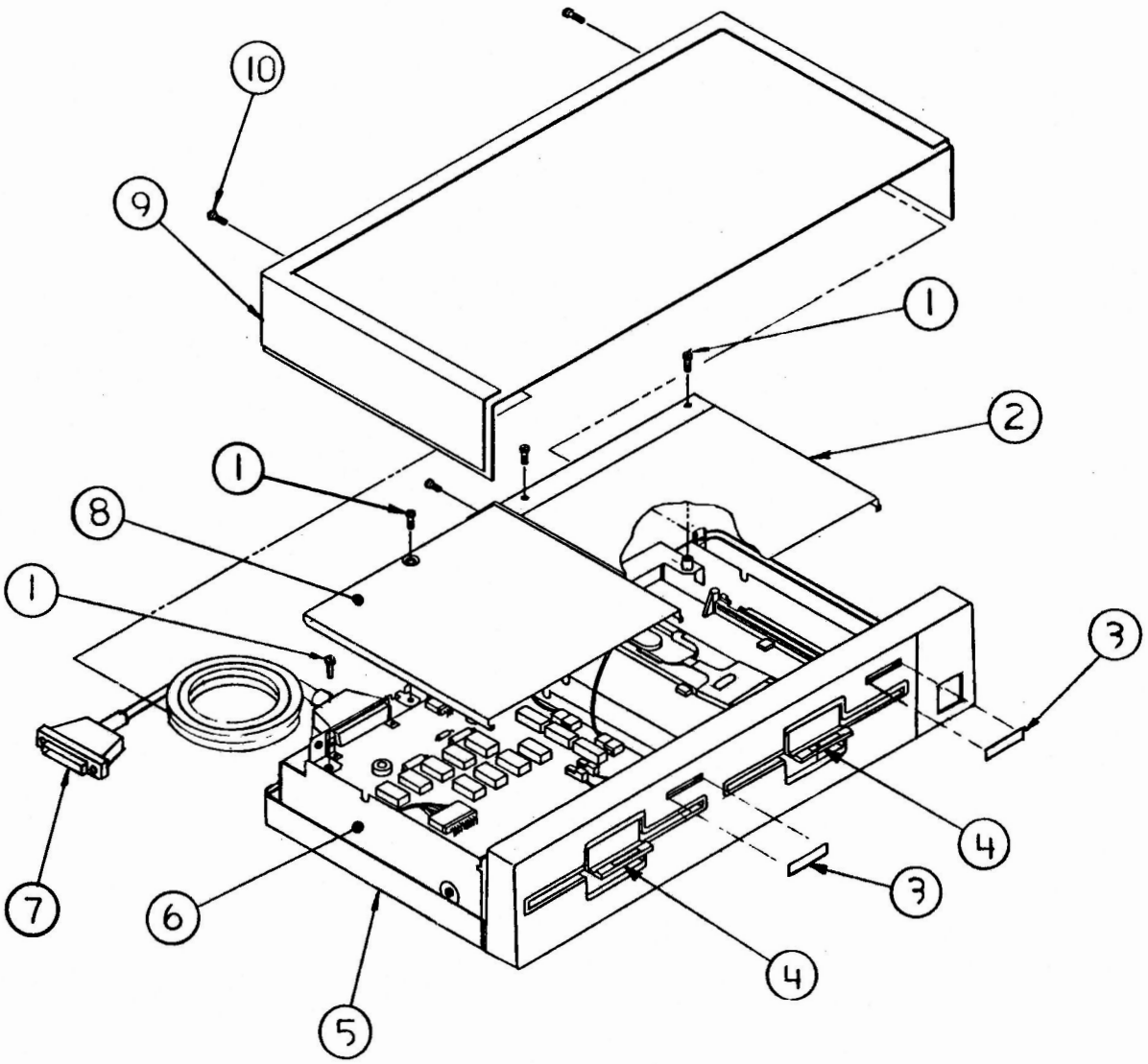


FIGURE 1

❑ EXTERNAL PARTS (Figure 1)

Item	Part No.	Description
1	400-1604	Screw, 6-32 x 1/4
2	805-5002	Drive 2 Top Shield
3	825-0548	Uni/DuoDisk Drive # Label
4	815-0637	Door, Beige
5	676-5101	Subassembly Bottom Cover
6	805-5000	DuoDisk Shield
7	590-0114	DuoDisk Cable
8	805-5001	Drive 1 Top Shield
9	676-5103	Top Cover Assembly
10	415-1410	Screw, M3.5 x 6 x 10mm, PN

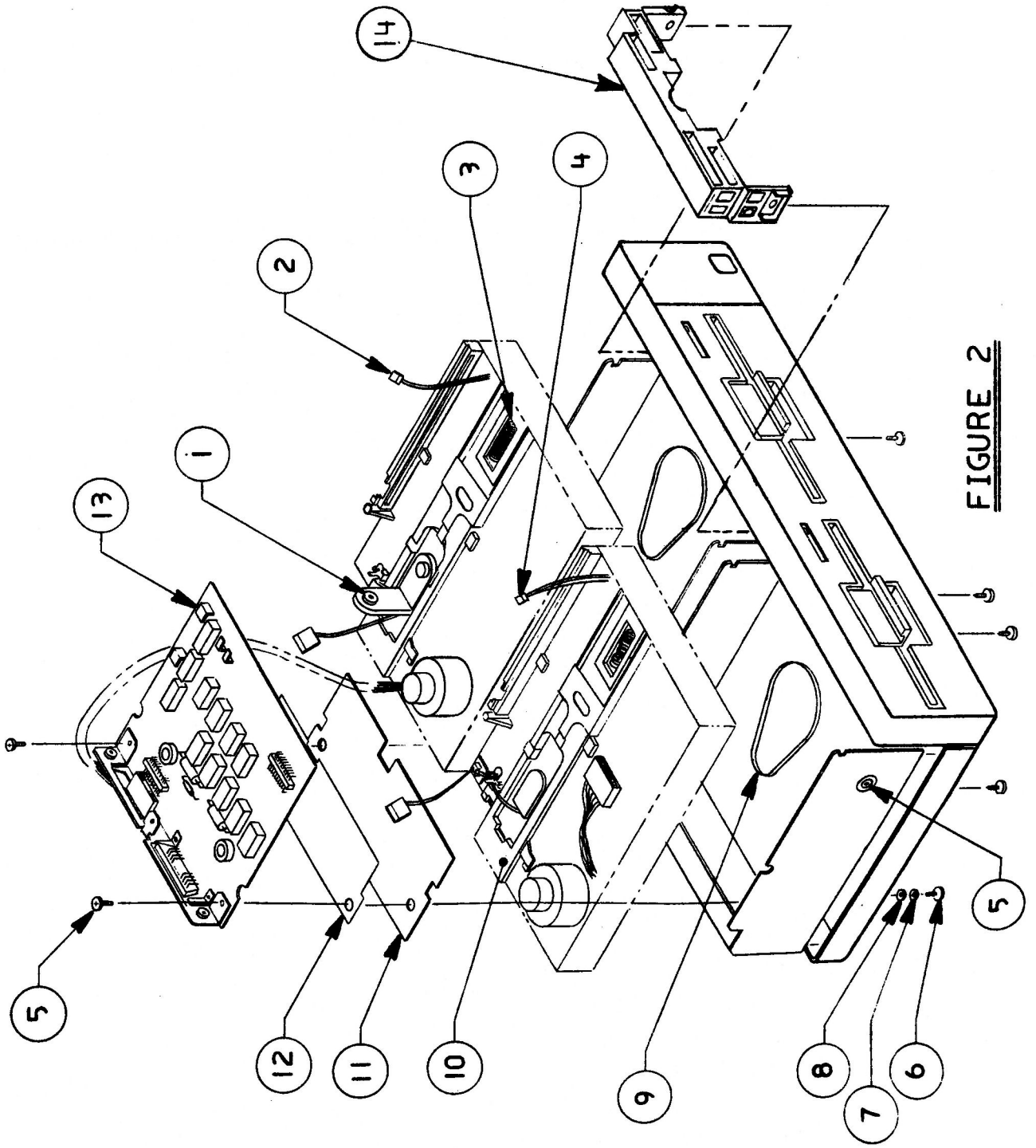


FIGURE 2

❑ INTERNAL PARTS (Figure 2)

Item	Part No.	Description
1	U815-0064	Load Button
2	590-0223	LED Cable Assembly, Drive 2
3	870-0023	Spring, Disk Door
4	590-0140	LED Cable Assembly, Drive 1
5	400-1604	Screw, 6-32 x 1/4
6	407-1605	Screw, 6-32 x 5/16 Pan Head
7	860-0242	Washer, M3.5 x 4.0 I.D. x 7.0 O.D.
8	860-0053	Washer, Split Lock Metric, M3.5
9	U880-0002	Disk Drive Belt
10	661-72128	Uni/DuoDisk Disk Mechanical Assembly
11	805-5028	Shield Plate
12	805-5029	Insulating Seat
13	661-92130	DuoDisk Analog Card
14	970-1258	Sub-Bezel, Uni/DuoDisk, Beige

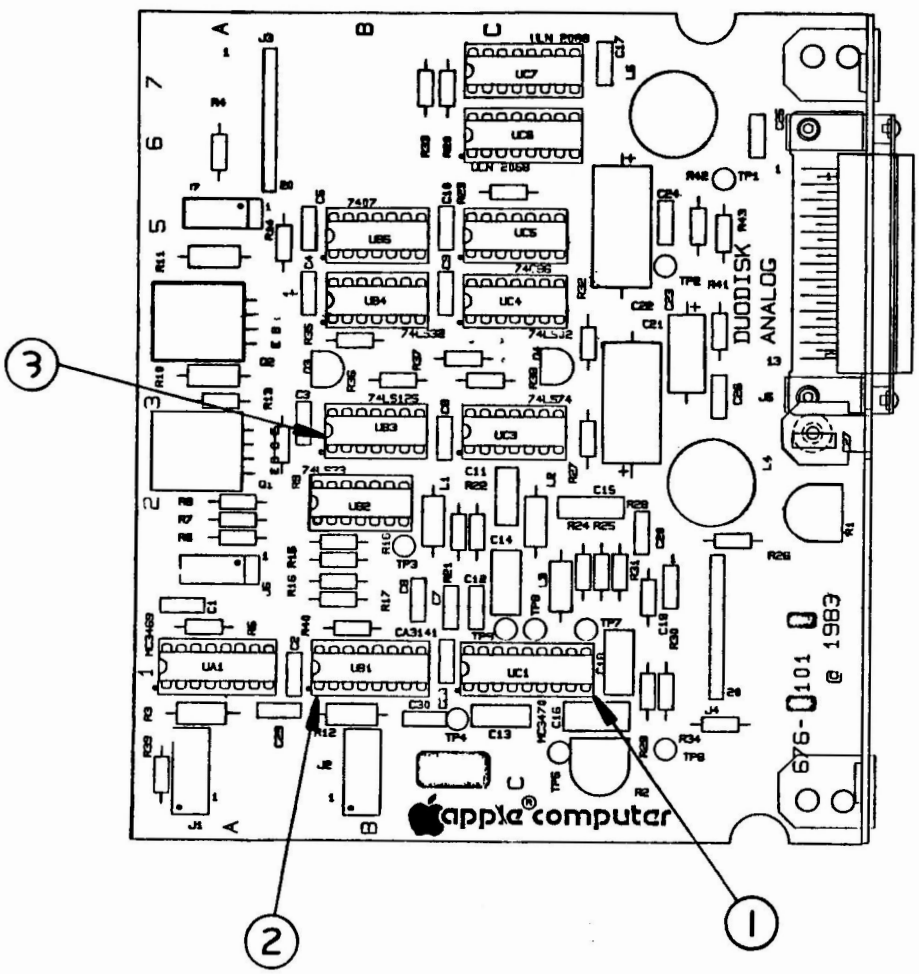


FIGURE 3

❑ ANALOG CARD (Figure 3)

Item	Part No.	Description
1	355-3470	IC, MC3470 Floppy Disk Read Ampl.
2	352-3141	IC, High Voltage Diode 30V, 100 mA
3	306-0125	IC, 74LS125