

Macintosh II

Table of Contents

Section 1 – Basics

1.3	Product Description
1.3	New Features
1.3	Configurations
1.4	Connector Identification
1.4	Back Panel
1.5	Internal Connectors
1.6	Theory of Operation
1.6	Introduction
1.6	System Startup
1.7	Logic Board
1.12	Video Interface Card
1.12	Power Supply
1.12	800K Internal Disk Drives
1.12	Internal Hard Disk SCSI
1.13	Block Diagram

Section 2 – Take-Apart

2.2	Electrostatic Discharge Prevention
2.2	Top Cover
2.4	Video Interface Card
2.5	Drive Mount
2.8	Disk Drives
2.10	Hard Disk SCSI
2.12	SIMMs
2.14	Logic Board
2.16	Power Supply

Section 3 – Diagnostics

3.2	Introduction
3.3	MacTest Copy Program
3.3	Making a Backup Diskette
3.4	Materials Required
3.4	Backup Procedure
3.6	Using Your Backup Diskette
3.7	Running <i>MacTest II</i>

...Continued on next page

3.7	What If...
3.7	Materials Required
3.7	Installing the Loopbacks
3.8	Using the <i>MacTest II</i> Menus
3.11	Running the Tests
3.13	Diagnostic Sound Sampler
3.13	Introduction
3.13	Materials Required
3.14	SCSI Loopback Jumper Procedure
3.14	To Determine If a Jumper Is Needed
3.15	To Install the Jumper

Section 4 – Troubleshooting

4.3	Introduction
4.3	General Information
4.3	Before You Start
4.3	Error Chords
4.3	How to Use the Symptom Charts
4.4	How to Use the Troubleshooting Flow Charts
4.4	Things to Remember
4.6	Module Exchange Information
4.6	Logic Board Configuration
4.6	Internal Hard Disk SCSI
4.7	Startup and Error Chords
4.7	Introduction
4.7	Startup Chord
4.7	Error Chords
4.9	Summary
4.10	Symptom Chart
4.10	Video Problems
4.11	Drive Problems
4.12	Peripheral Problems
4.13	Miscellaneous Problems
4.14	Macintosh II Flow Charts
4.14	Flow Chart 1
4.16	Flow Chart 2
4.18	Flow Chart 3
4.20	Flow Chart 4
4.22	Flow Chart 5
4.24	SIMM Verification
4.24	Introduction
4.24	Isolating to the Customer's SIMMs
4.25	Verification
4.26	Verification Flow Chart
4.28	Battery Verification
4.28	Introduction
4.28	Materials Required
4.29	Verification Procedure
4.30	Customer's Configuration Chart

Section 5 –	5.2	Logic Board RAM Identification and Upgrades
Additional Procedures	5.2	Introduction
	5.2	Identification
	5.4	Upgrades
	5.6	Video Card RAM Upgrade
	5.6	Introduction
	5.6	Materials Required
	5.6	Installation
	5.6	Troubleshooting the Video RAM Upgrade
	5.6	Materials Required
	5.6	Procedure
	5.7	Battery Replacement
	5.7	Storage and Handling
	5.7	Disposal
	5.8	Procedure
	5.9	Materials Required
 Illustrated		
Parts List	IPL.3	System (Figure 1)
	IPL.5	Logic Board (Figure 2)
	IPL.7	Video Board (Figure 3)
	IPL.9	Keyboard (Figure 4)
	IPL.11	Extended Keyboard (Figure 5)
	IPL.13	Mouse (Figure 6)

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□ CONTENTS

1.3	Product Description
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1.4	Connector Identification
1.4	Back Panel
1.5	Internal Connectors
1.6	Theory of Operation
1.6	Introduction
1.6	System Startup
1.7	Logic Board
1.12	Video Interface Card
1.12	Power Supply
1.12	800K Internal Disk Drives
1.12	Internal Hard Disk SCSI
1.13	Block Diagram

□ PRODUCT DESCRIPTION

The Macintosh II is a high-performance, open-architecture Macintosh. As the high-end computer of the Macintosh line, it was designed to run existing software while providing the power, flexibility and expandability necessary for future applications.

New Features

The Macintosh II has the following new features:

- Increased speed
- More RAM (up to 8 megabytes installed on the logic board)
- Expansion slots
- Larger video screen and color monitor option
- Compatibility with previous Macintosh systems
- Compatibility with alternative operating systems

Configurations

The Macintosh II will be available in two configurations: the entry system and the hard disk system.

Entry System

The entry system includes the following elements:

- 68020 microprocessor
- 68881 floating point co-processor
- Hochsprung Memory Management Unit (HMMU)
- 1 Megabyte of RAM
- 1 800K internal 3.5-inch disk drive

The following enhancement kits can be added to the entry system:

- One 800K internal 3.5-inch disk drive
- 20, 40, or 80 Megabyte SCSI hard disk
- 68851 Programmable Memory Management Unit (PMMU)
- RAM up to 8 Megabytes

Hard Disk System

The hard disk system includes the following elements:

- 68020 microprocessor
- 68881 floating point co-processor
- Hochsprung Memory Management Unit (HMMU)
- 1 Megabyte of RAM
- 1 800K 3.5-inch disk drive
- 40 Megabyte internal hard disk SCSI

The following enhancement kits can be added to the hard disk system:

- 1 800K internal 3.5-inch disk drive
- 68851 Programmable Memory Management Unit (PMMU)
- RAM up to 8 Megabytes

□ CONNECTOR IDENTIFICATION

Back Panel

The back panel of the Macintosh II has six built-in ports, two connectors, and a reset switch, as listed below. The number beside the item below corresponds to the numbered arrow in Figure 1.

1. Apple DeskTop Bus 1 and 2
2. Serial Port 1 (Printer)
3. Serial Port 2 (Modem)
4. Sound Port
5. SCSI Port
6. AC Power Connector
7. Monitor Connector
8. Hardware on switch (reset)

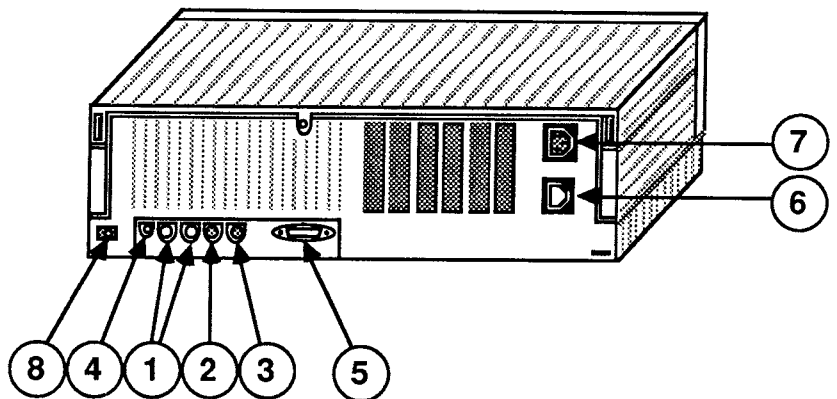


FIGURE 1

Internal Connectors

There are six connectors on the Macintosh II logic board. In the list below, the number beside the connector name corresponds to the numbered arrow in Figure 2.

1. Internal SCSI connector
2. Power connector for internal SCSI
3. Internal disk drive 2 (left)
4. Internal disk drive 1 (right)
5. Power connector for the logic board
6. Speaker connector

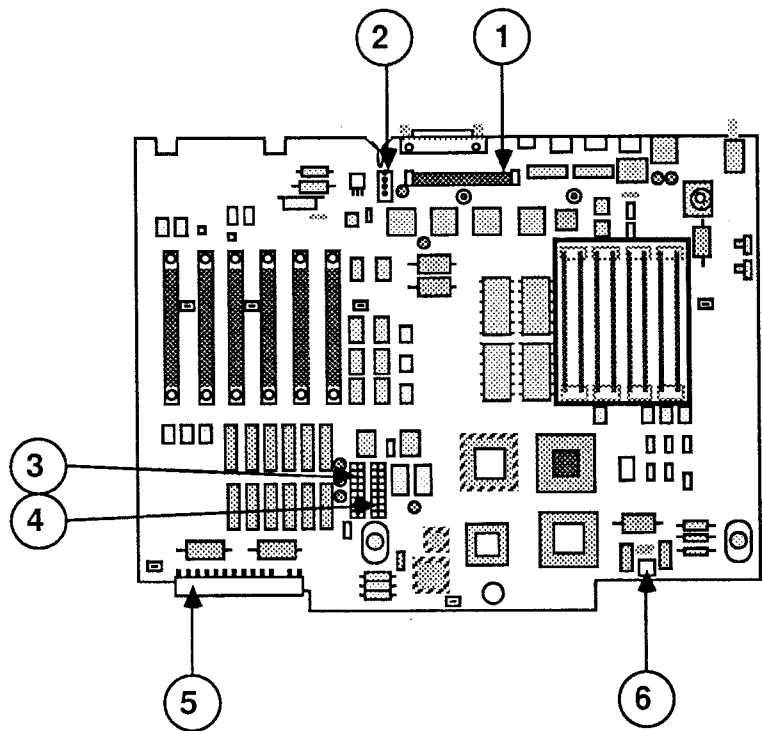


FIGURE 2

□ THEORY OF OPERATION

Introduction

The Macintosh II is made up of three basic modules: the logic board, the power supply, and the video interface card. Internally it can have one or two 800K disk drives and/or one hard disk SCSI.

The information here will provide you with an understanding of how the Macintosh II works. This, in turn, will assist you in performing logical troubleshooting on the Macintosh II system.

System Startup

The two replaceable batteries on the logic board monitor the reset switch. When the reset switch on the Macintosh II is pressed, the system begins a carefully synchronized sequence of events.

First the processor is held in a wait state while a series of circuits gets the system ready for operation. During this time, the Versatile Interface Adapters and the Integrated Woz Machine (described later in this section) are initialized, and the mapping of RAM and ROM is altered temporarily in order to test the system.

The system software then performs a RAM test to determine how much RAM is present in the machine. This information is then stored in a global variable, and several other system tests are performed. When the system is fully tested and initialized, system RAM is mapped for normal operation.

At this point the disk startup process begins. The system looks for a readable disk in the available disk drives in the following order:

1. Disk drive one (right side)
2. Disk drive two (left side)
3. Setup device set in the Control Panel
4. Internal SCSI hard disk (or SCSI hard disk with device ID of 0)
5. SCSI devices in declining order of device priority

Once a readable disk is found, it is read and the disk startup process is completed.

Logic Board

The logic board is the heart of the system, where all processing of information takes place. What follows is a list of the major components of the Macintosh II logic board and the functions they perform.

Microprocessor

The Macintosh II contains a 68020 microprocessor that supports both a 24- and 32-bit processing mode. The system runs at 15.6672 MHz for high performance. When running in the 24-bit processing mode, the Macintosh II is compatible with the majority of existing applications for the Macintosh.

The 68881 co-processor is a IEEE P754 standard floating point IC that can provide a high degree of precision and speed for the Macintosh II programs.

RAM

The RAM is provided in packages known as Single In-Line Memory Modules (SIMMs). Each SIMM consists of a small printed circuit board with eight surface-mounted dynamic RAM (DRAM) chips. On one edge of each SIMM is a contact that fits into the SIMM sockets located on the logic board.

The amount of RAM on the logic board can be changed by installing the same size SIMMs in either Bank A or B, with the larger RAM size in Bank A (the first four rows closest to the edge of the board).

Various RAM configurations are possible, depending on how many SIMMs are used and on the size of the DRAM chips.

Every time the Macintosh II is powered on, the system software performs a memory test to determine how much RAM is present in the machine.

ROM

The ROMs are the system's permanent Read Only Memory. The Macintosh II presently contains four ROM chips providing 256K of ROM. The Macintosh II ROMs contain the routines for the Toolbox, the Operating System, and other necessary system routines. The Macintosh II ROM sockets can accept ROM chips that would provide 512K of ROM.

An optional ROM configuration is the installation of a 64-pin SIMM into the ROM sockets on the Macintosh II logic board. This will allow upgrades to the ROM without replacing the logic board.

Versatile Interface Adapters

The Macintosh II contains two SY6522A Versatile Interface Adapters (VIAs). These chips, known as VIA1 and VIA2, provide maximum compatibility with existing Macintosh software.

VIA1

VIA1 provides the Macintosh II system with most of the signals from the 68000-based Macintosh configuration. It also provides access to new features, including an Apple DeskTop Bus interrupt and a synchronous modem signal.

VIA2

VIA2 controls the HMMU; decodes the NuBus Slot interrupts, a SCSI interrupt, and the Digital Sound Chip interrupt; powers the unit off; blocks NuBus accesses to RAM; and determines errors that occur in NuBus transactions.

The access time between the two VIA chips and the 68020 is 500ns. The VIA's internal frequency is 783.36 KHz.

HMMU

The Hochsprung Memory Management Unit (HMMU) allows Macintosh software to use the 24-bit address line mode of 68000-based Macintoshes while new software can use the new 32-bit address mode.

PMMU

The Programmable Memory Management Unit (PMMU or 68851) will allow the use of the UNIX operating system, as well as support both the 24-and 32-bit address modes.

Integrated Woz Machine

The Macintosh II is capable of supporting two internal 800K 3.5-inch drives. The disk interface uses the Apple custom Integrated Woz Machine (IWM) chip to control the drives. Together with the VIA, the IWM generates all the signals needed to read, write, format, and eject diskettes.

The IWM is clocked at 15.6672 MHz, which is twice the frequency used in previous Macintosh systems. An internal "divide by two" circuit is used to access 400K or 800K drives.

Small Computer Standard Interface

The Small Computer Standard Interface (SCSI) chip controls a high-speed parallel port for communicating with up to seven SCSI peripherals.

The Macintosh II SCSI port differs from the industry SCSI standard in two ways.

1. A DB-25 connector is used instead of the standard 50-pin ribbon connector. An adapter is available to convert the connector to the standard.
2. Power for termination resistors is not provided. If the attached SCSI device does not have the required terminator resistor, an Apple-manufactured terminator block must be installed on the last device.

Serial Communications Controller

The two serial ports are controlled by the Serial Communications Controller (SCC). Macintosh II serial ports conform to the EIA standard RS422.

The Macintosh II uses two Mini-DIN 8 connectors for the two ports. The ports provide an output handshake but do not provide the +5 and +12 volts found on the Macintosh 128K, 512K, and 512K enhanced serial ports.

Apple Sound Chip

The Apple Sound Chip generates a stereo/audio signal. This signal is filtered and buffered by two additional chips and then sent to the external stereo mini-phone jack and the internal speaker.

The sound generation system in the Macintosh II supports the previous Macintosh modes, while offering a complete set of new ROM tools in the Software Sound Manager for performing sound generation.

Real-Time Clock

The Macintosh II real-time clock is a custom chip. It contains 256 bytes of RAM that are powered by a battery when external power is turned off. These RAM bytes are called parameter RAM. They store the configuration of ports, the clock setting, and other data that needs to be preserved even when the system power is not available.

Apple DeskTop Bus

The Apple DeskTop Bus (ADB) is a serial communication bus used to connect keyboards, mouse devices, graphic tablets, and other input devices to the system. The mini 4-pin ADB connector connects the devices to the Macintosh II.

The microprocessor normally samples the state of each device by using the control lines in VIA2 to read or write to the Apple DeskTop modem chip.

ADB Devices

All devices that are made for the Apple DeskTop Bus have some kind of microprocessor that makes them intelligent devices. All ADB devices, except the mouse, have ports for connecting other ADB devices. The mouse must be the last device attached to the Apple DeskTop Bus because it has no port.

There are two Apple ADB keyboards, the Apple Keyboard and the Apple Extended Keyboard. Both keyboards connect to the Apple DeskTop Bus port on the rear of the Macintosh II. Both keyboards have their own microprocessors, which are called Keyboard Microcontrollers. The keyboards operate asynchronously, issuing commands on the ADB and transmitting and receiving data to and from the ADB devices.

NuBus Interface

The Macintosh II has six expansion slots to support Apple standard peripherals and increase RAM size. Each expansion slot is a 96-pin DIN connector that uses the NuBus Interface to communicate with the system. The following are a few of the cards that will go into the NuBus slots:

- video card
- co-processor card
- extra RAM
- Ethernet™ (and other networks)
- add-on SCSI port card

The NuBus has three major states of communication with the Macintosh II system:

- **Processor to NuBus**, which is activated whenever the microprocessor generates a physical slot address. If a device responds, the data is transferred.
- **NuBus to Processor Bus**, which is for accesses to RAM, ROM, and I/O to and from NuBus. There are two control functions being performed for this process. One tracks the changes on NuBus, and the other lets the 68020 tell NuBus what to do next.
- **NuBus timeout**, which is required to prevent accesses to empty slots, which would result in hanging up the system.

Every NuBus card should contain a ROM that provides information to the operating system at startup. The ROM information ensures that drivers are properly installed and that the card is initialized and recognized by the system.

Power Control

The Macintosh II has a hardware-on/software-off circuit to control the power supply.

There are two power switches on the system: one on the rear of the Macintosh II, and a secondary power switch (the reset button) on the Apple DeskTop Bus keyboard.

The power-off function is under software control. It allows the computer to clean up any pending activity before powering off. The power can be turned off by a menu selection or by the secondary power switch. If the software fails to turn off the machine, unplug it.

Video Interface Card

The Video Interface Card is a high-performance color graphics card based on a custom chip called Toby Frame Buffer controller (TFB). The card is capable of supporting any RS170-compatible monitor.

The Video Interface Card comes with 256K of video RAM installed. An expansion kit allows upgrading to 512K of RAM, allowing up to 256 colors or shades of gray to be displayed.

Power Supply

The power supply operates on standard line voltage and outputs +5v, +12v, and -12v DC voltages, which are used by the logic board, the internal devices, and the slots.

800K Internal Disk Drives

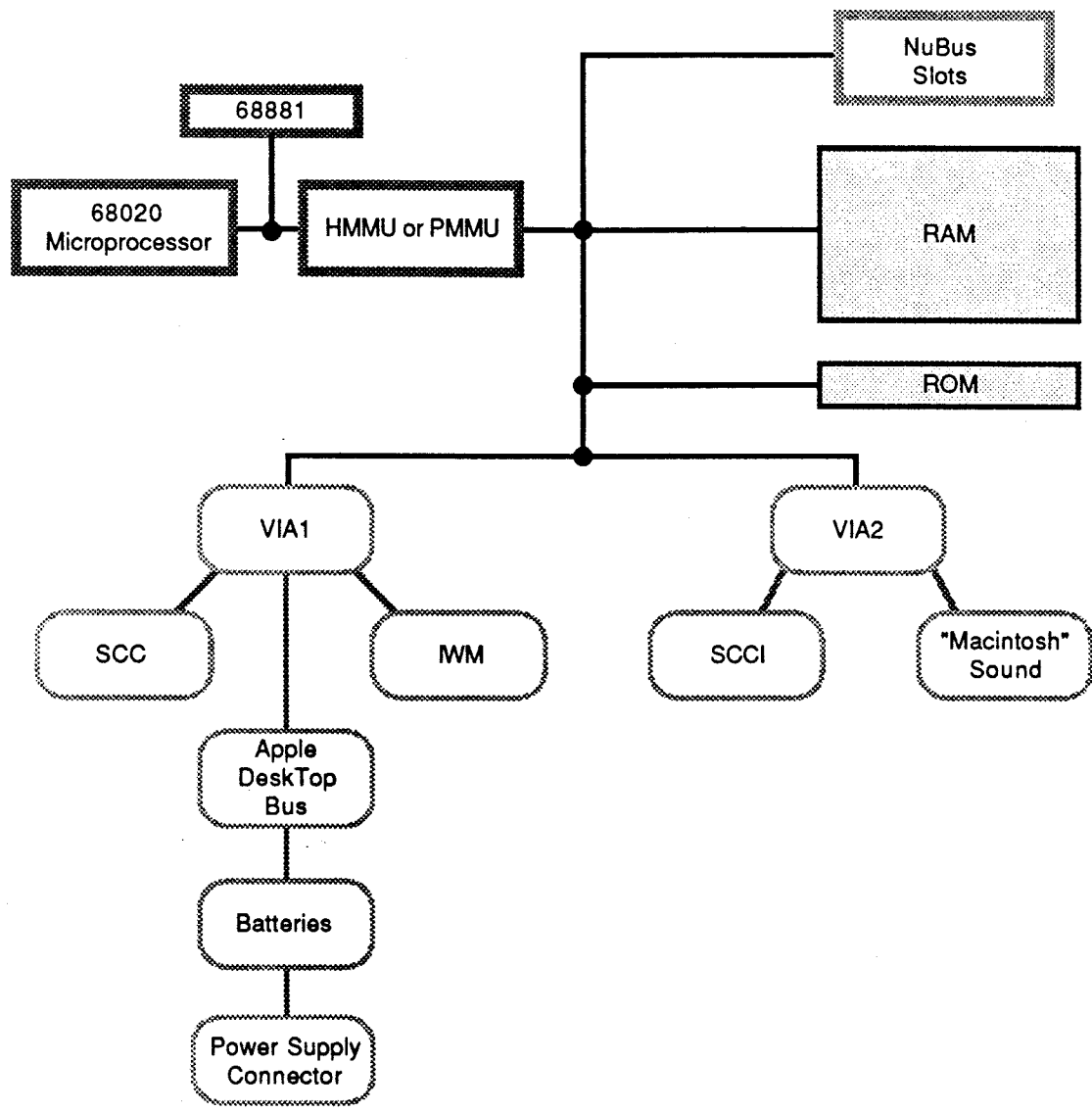
The internal 800K disk drive(s) connects to the main logic board through two internally installed connectors. The flow of data between the logic board and the disk drives is channeled through the IWM disk controller, which controls reading and writing operations.

Internal Hard Disk SCSI

The optional hard disk connects to the logic board through the internal SCSI connector. Other SCSI devices may be daisy chained to the external SCSI port.

Block Diagram

You now have a basic understanding of the components on the logic board. Below is a simplified block diagram of the information you have just read. Refer back to the appropriate component if you need to refresh your memory.



Macintosh II

Section 2 – Take-Apart

□ CONTENTS

2.2	Electrostatic Discharge Prevention
2.2	Top Cover
2.4	Video Interface Card
2.5	Drive Mount
2.8	Disk Drives
2.10	Hard Disk SCSI
2.12	SIMMs
2.14	Logic Board
2.16	Power Supply

❑ ELECTROSTATIC DISCHARGE PREVENTION

The Macintosh II contains C-MOS components, and the Macintosh II RAM memory is installed on small separate boards called SIMM modules. Both the C-MOS and the SIMM modules are very susceptible to damage from electrostatic discharge (ESD).

Preventive measures must be taken to avoid ESD damage. When you are unwrapping, installing, or replacing any modules, observe the appropriate ESD precautions.

For complete ESD prevention information, refer to *You Oughta Know*, Section 6.

❑ TOP COVER

Materials Required

Phillips screwdriver

Remove

1. Remove the Phillips screw from the rear of the case (Figure 1, #1).
2. Locate the tabs on the rear of the machine (Figure 1, #2), one on each side.
3. Push the tabs in with your index fingers and lift the top cover, back first, from the machine. No force is necessary. (Do not push down on the top of the machine with your thumbs.)

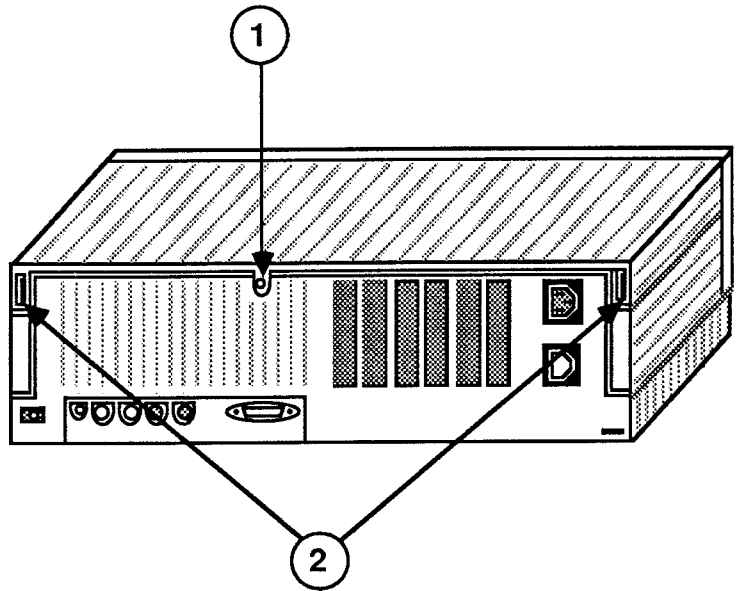


FIGURE 1

Replace

1. Position the top cover on the case, front first. Be sure to align the three notches on the front with the three tabs on the case.
2. Lower the top cover until the rear tabs snap into position.
3. Replace the Phillips screw (Figure 1, #1).

❑ VIDEO INTERFACE CARD

The following procedure can be used for any card that is installed in the Macintosh II.

Materials Required

Phillips screwdriver

Remove

1. Remove the top cover.
2. Remove the fastening screw (if present) that holds the card in place. Put the screw where it will not get lost.
3. Grasp the card by the upper edges and remove it. Gently tilt the board forward and back while pulling upward, putting the least possible stress on the logic board.

Replace

1. Remove the fastening screw on the strip behind the expansion slot you intend to use, and push the plastic cover out of the hole.
2. Gently position the card over the slot so that the hood on the bottom of the card lines up with the slot. The screw holder at the top of the card should line up with the screw hole on the computer.
3. Push down on the card, and gently tilt the board forward and back until it is sitting securely in the slot. Avoid putting excess stress on the logic board.
4. Replace the fastening screw to hold the card in place.
5. Replace the top cover.

□ DRIVE MOUNT

The drive mount is a metal frame that has the disk drives installed on it. The drive mount is then installed into the case of the Macintosh II.

Materials Required

Phillips screwdriver

Remove

1. Remove the top cover and then the video card (and any other cards installed).
2. Remove the four Phillips screws that hold the drive mount in position (Figure 2, #1).

Note: The drives in the machine will vary depending on the customer's configuration. Disregard the instructions that do not apply to the system you are working on.

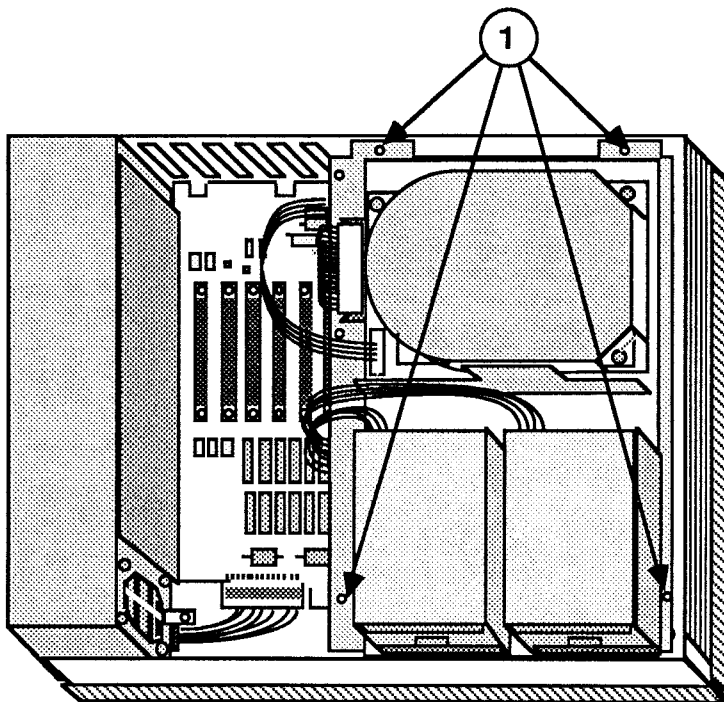


FIGURE 2

3. Disconnect the drive cables. Disconnect the cable from disk drive 1 (Figure 3, #1). Disconnect the cable from disk drive 2 (Figure 3, #2).
4. Disconnect the power connector that runs to the SCSI hard disk (Figure 3, #3).
5. Disconnect the SCSI hard disk cable from the hard disk (Figure 3, #4).
6. Remove the drive mount plate.

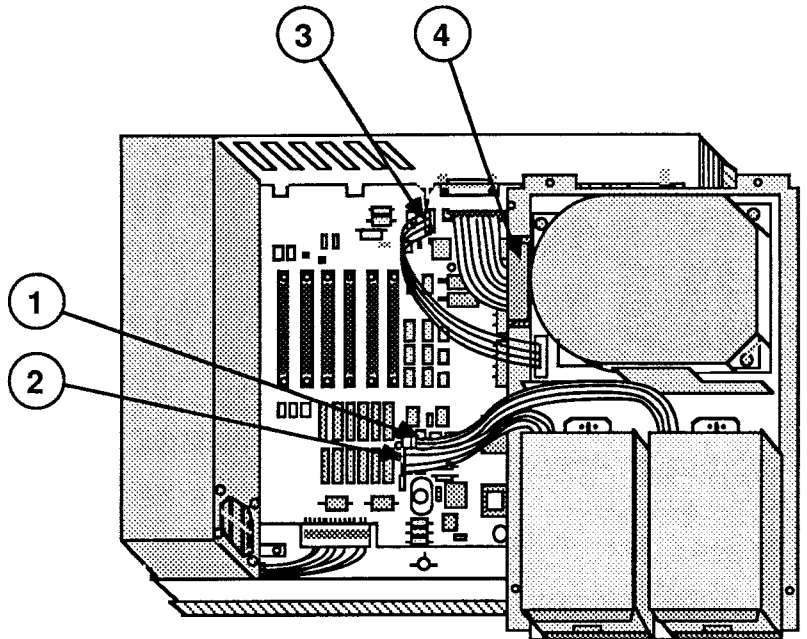


FIGURE 3

Replace

1. Position the drive mount plate so that the screw holes line up with the holes on the case.

Note: The drives in the machine will vary depending on the customer's configuration. Disregard the instructions that do not apply to the system you are working on.

2. Connect the power connector that runs to the SCSI hard disk (Figure 3, #3).
3. Connect the SCSI hard disk cable to the hard disk (Figure 3, #4).
4. Connect the drive cables. Connect the cable from disk drive 1 (Figure 3, #1). Connect the cable from disk drive 2 (Figure 3, #2).
5. Replace the four Phillips screws that hold the drive mount in place (Figure 4, #1).
6. Replace the video card (and any other cards installed) and then the top cover.

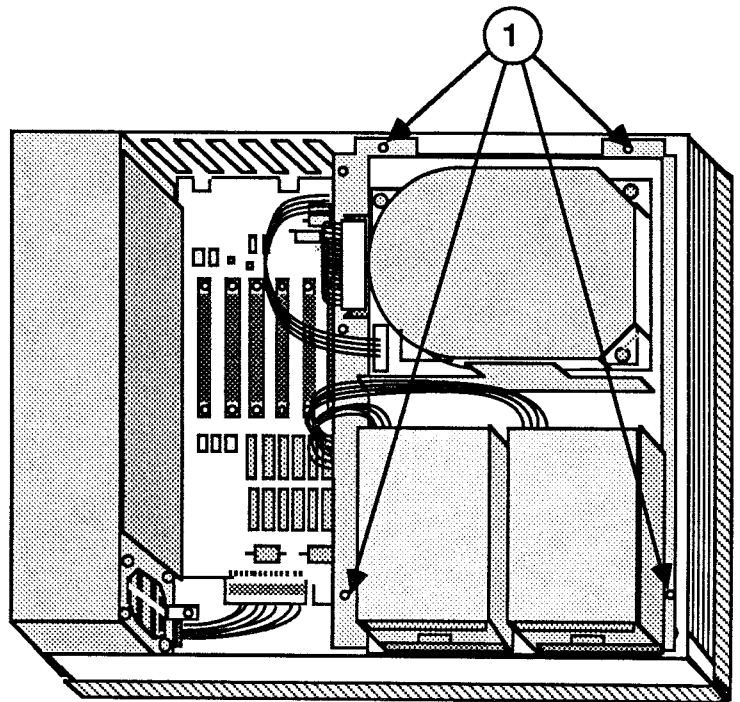


FIGURE 4

□ DISK DRIVES

The Macintosh II can have two internal disk drives. Drive 1 is located on the right side of the drive mount; its cable is connected to J16 (Figure 5, #1). Drive 2 is located on the left side of the drive mount; its cable is connected to J17 (Figure 5, #2).

Materials Required

Phillips screwdriver

Remove

1. Remove the top cover and then the video card (and any other cards installed).
2. Remove the drive mount.
3. Remove the screw holding the appropriate drive in position:

For disk drive 1, see Figure 6, #1.

For disk drive 2, see Figure 6, #2.

4. Lift the rear of the drive, slide it back, and lift it off the drive mount.

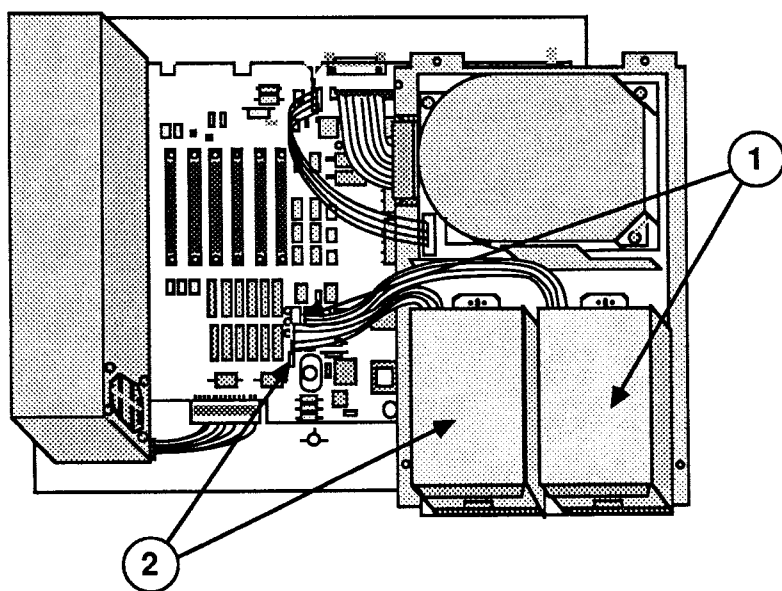


FIGURE 5

Replace

1. Position the front of the drive so that the two tabs on the drive case slide into the two holes on the drive mount. Lower the drive into position, making sure that the screw holes line up.
2. Remove the screw holding the appropriate drive in position:

For disk drive 1, see Figure 6, #1.

For disk drive 2, see Figure 6, #2.

3. Replace the drive mount.
4. Replace the video card (and any other cards installed) and then the top cover.

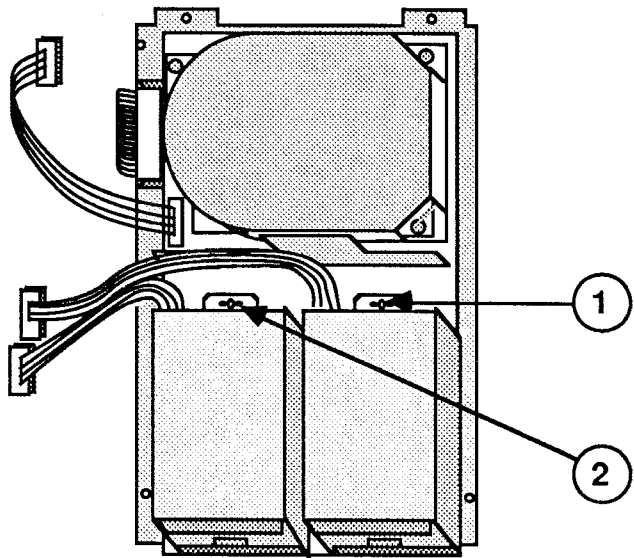


FIGURE 6

□ HARD DISK SCSI

Refer to Section 6, Additional Procedures, for more information on the Hard Disk SCSI.

Materials Required

Phillips screwdriver

Remove

1. Remove the top cover and then the video card (and any other cards installed).
2. Remove the drive mount.
3. Remove the two Phillips screws holding the hard disk in position:

For the 5.25-inch Hard Disk SCSI, see Figure 7, #1.

For the 3.5-inch Hard Disk SCSI, see Figure 8, #1.

4. Lift the hard disk from the side with the cable connector, slide it back, and lift it off the drive mount.

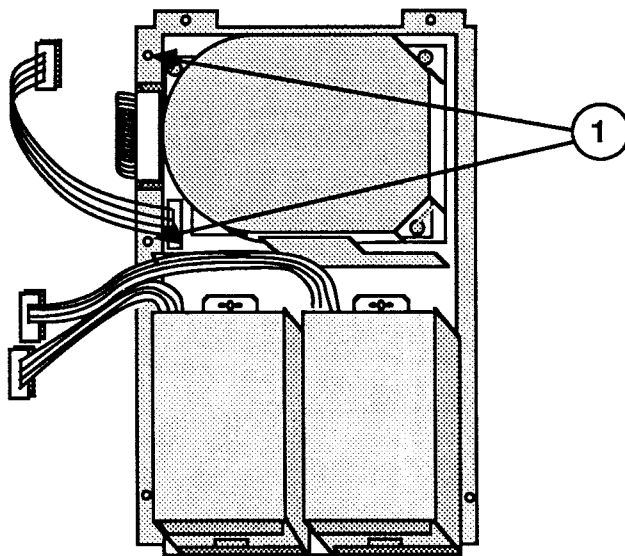


FIGURE 7

Replace

1. Position the front of the hard disk so that the two tabs on the hard disk case slide into the two holes on the drive mount. Lower the hard disk into position, making sure that the screw holes line up.
2. Replace the two Phillips screws holding the hard disk in position:

For the 5.25-inch Hard Disk SCSI, see Figure 7, #1.

For the 3.5-inch Hard Disk SCSI, see Figure 8, #1.

3. Replace the drive mount.
4. Replace the video card (and any other cards installed) and then the top cover.

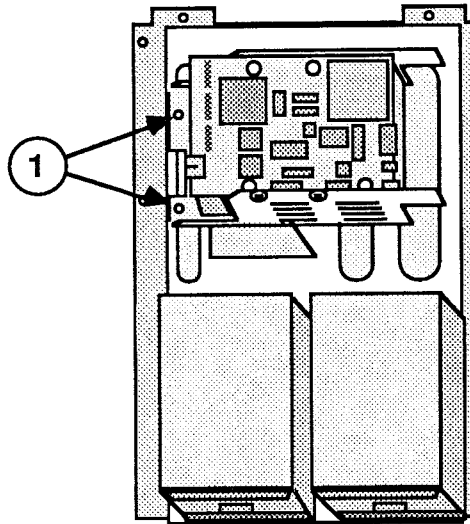


FIGURE 8

□ SIMMs

For identification of the two types of SIMMs and the various configurations available, refer to Section 6, Additional Procedures.

There are eight sockets available for SIMMs on the Macintosh II logic board (Figure 9, #1). The configurations that **do not work** are one single SIMM or two SIMMs of different sizes.

CAUTION: *SIMMs are very susceptible to damage from ESD and skin acid. Handle them only by the edges!*

Materials Required

Grounded workbench pad and wriststrap

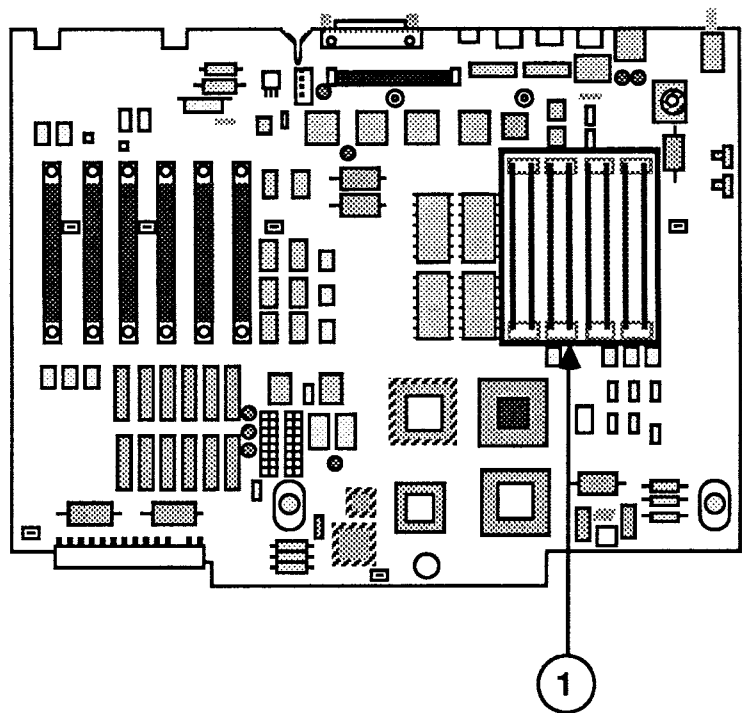


FIGURE 9

Remove

1. Remove the top cover and then the drive mount.
2. To remove a SIMM, push outward on the plastic holders (Figure 10, #1) at the ends of the SIMM until you hear a click. Then lift out the SIMM.

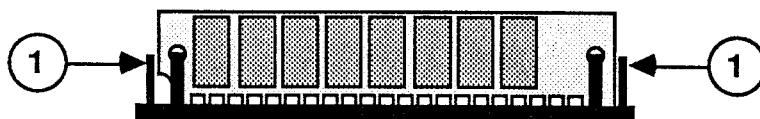


FIGURE 10

Replace

1. With the contacts (Figure 11, #1) on the SIMM pointing down, set the SIMM into the connector at an angle. Push back on the top corners of the SIMM. You will hear a click when the SIMM snaps into place.
2. Replace the drive mount and then the top cover.

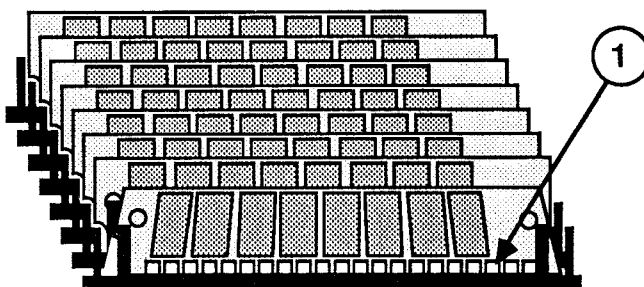


FIGURE 11

❑ LOGIC BOARD

Materials Required

Phillips screwdriver

Remove

1. Remove the top cover and then the video card (and any other cards installed).
2. Remove the drive mount.
3. Remove the two screws that hold the logic board in place (Figure 12, #1).
4. Starting at the front of the logic board, gently lift up the board as you push each of the six tabs, one at a time (Figure 13, #1).
5. Slide the logic board toward you and lift it from the case.

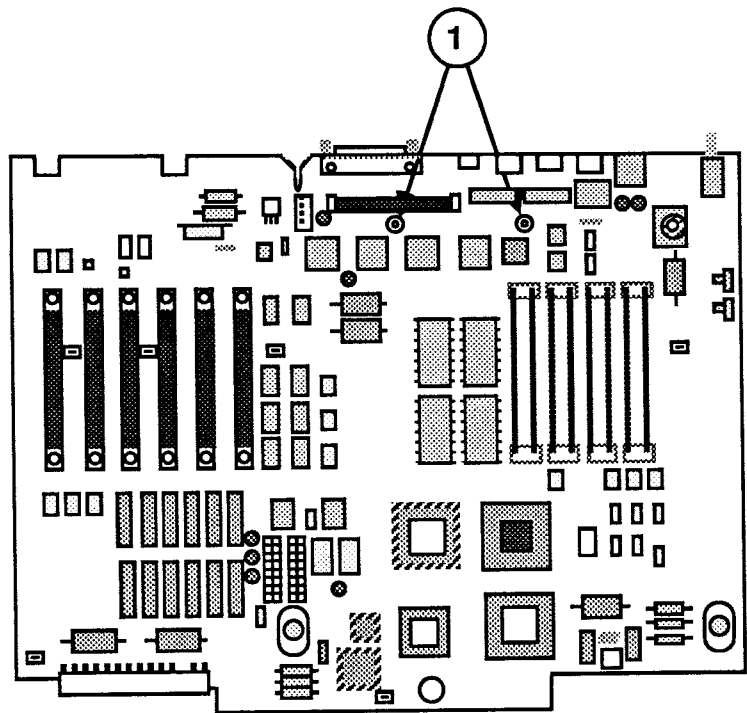


FIGURE 12

Replace

1. Position the logic board so that the port connectors on the rear are correctly positioned.
2. Gently lower the board into the case and press it onto the tabs (Figure 13, #1).
3. Replace the two screws (Figure 12, #1).
4. Replace the drive mount.
5. Replace the video card (and any other cards installed) and then the top cover.

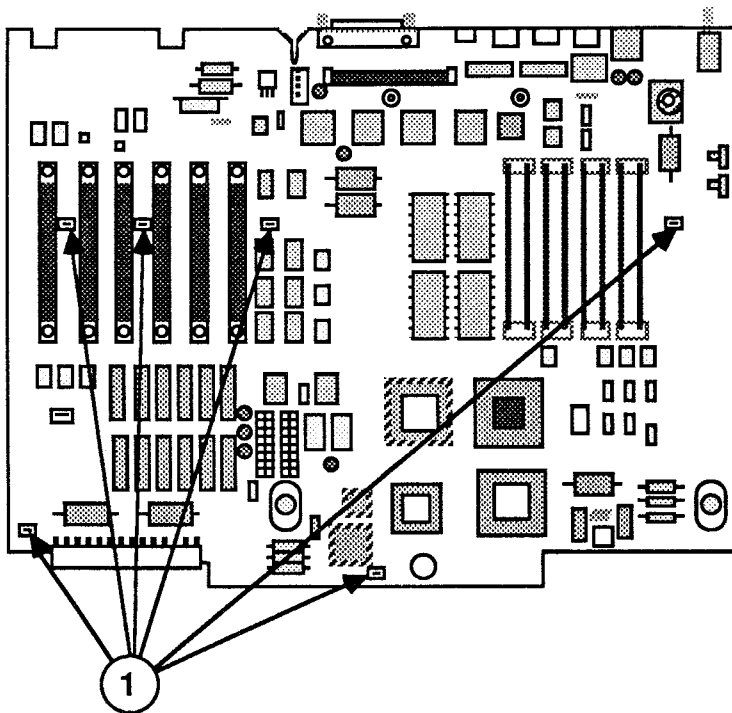


FIGURE 13

❑ POWER SUPPLY

Materials Required

Phillips screwdriver

Remove

1. Remove the top cover, and then the video card (and any other cards installed).
2. Disconnect the power supply cable from the logic board (Figure 14, #1). If necessary, use a small flatblade screwdriver to pry the cable loose.
3. Remove the Phillips screw that holds the power supply in place (Figure 14, #2).
4. Lift the power supply, front first, from the case.

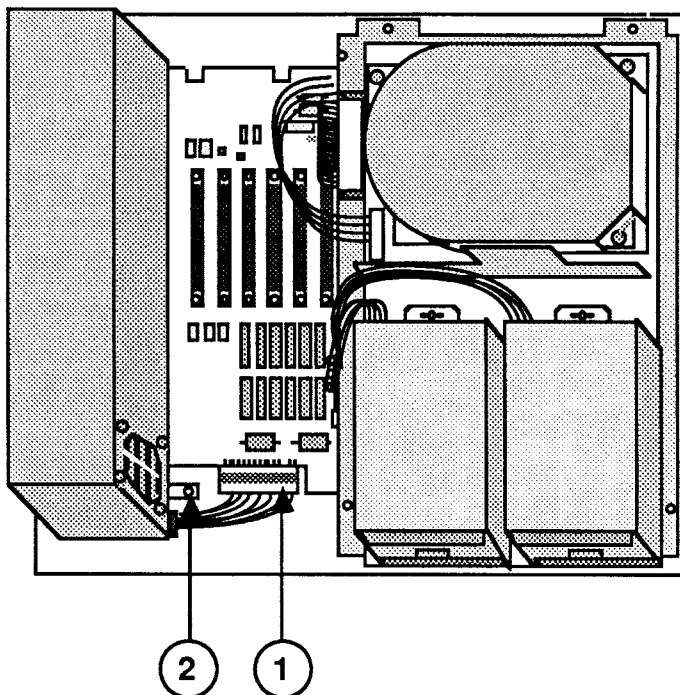


FIGURE 14

Replace

1. Position the power supply so that the AC connectors align with the holes in the rear of the case and so that the screw tab on the power supply aligns with the case.
2. Replace the Phillips screw that holds the power supply in place (Figure 14, #2).
3. Connect the power supply cable to the logic board (Figure 14, #1).
4. Replace the video card (and any other cards installed) and then the top cover.

Macintosh II

Section 3 – Diagnostics

□ CONTENTS

- 3.2 Introduction
- 3.3 MacTest Copy Program
- 3.3 Making a Backup Diskette
- 3.4 Materials Required
- 3.4 Backup Procedure
- 3.6 Using Your Backup Diskette
- 3.7 Running *MacTest II*
- 3.7 What If...
- 3.7 Materials Required
- 3.7 Installing the Loopbacks
- 3.8 Using the *MacTest II* Menus
- 3.11 Running the Tests
- 3.13 Diagnostic Sound Sampler
- 3.13 Introduction
- 3.13 Materials Required
- 3.14 SCSI Loopback Jumper Procedure
- 3.14 To Determine If a Jumper Is Needed
- 3.15 To Install the Jumper

□ INTRODUCTION

The *MacTest II* diskette tests the Macintosh II main logic board, internal floppy disk drives, video interface card, and SCSI bus. It also provides grid displays for use in adjusting the high-resolution monitors.

Note: *MacTest II* does not test the internal SCSI hard disk. To test the hard disk, use the *Macintosh Hard Disk Drive Diagnostic* diskette (see Section 3, Diagnostics, in the *SCSI Hard Disk Drives Technical Procedures*).

MacTest II is a pass/fail confidence test. As the test progresses, messages on the screen indicate which area is under test. As soon as a failure is detected, the test stops and the screen indicates which module must be replaced before the test can be completed.

The *MacTest II* diskette also contains the **MacTest Copy Program** and the **Diagnostic Sound Sampler**.

- The **MacTest Copy Program** works on the Macintosh Plus, Macintosh SE, or Macintosh II. **This program must be used to make all backup copies of the various *MacTest* diskettes.**
- The **Diagnostic Sound Sampler** lets you listen to the various musical chord sequences that are generated during a power-on failure.

□ MACTEST COPY PROGRAM

Making a Backup Diskette

Make a backup diskette before you begin! When testing a defective Macintosh II, it is possible to damage or erase a section of the *MacTest II* diskette.

Use the MacTest Copy Program on the *MacTest II* diskette to make all backup copies of the various *MacTest* diskettes. Features of the program that you should be aware of include the following:

- **You can make backup copies on any Macintosh,** regardless of which *MacTest* program you are copying. For example, you can copy the *MacTest II* diskette using a Macintosh Plus or a Macintosh SE. The copy does not have to be made on the Macintosh II.
- **You can make a copy using a single disk drive system.** Just select the same drive for both the **Source** and **Destination**; then follow the instructions given on the screen.
- **You can easily and quickly make multiple copies if enough memory is available. Same Source** automatically becomes highlighted and selected, which means that the program will keep prompting you for diskettes to copy to until you select **New Source** or **Quit** from the **File** menu. This will only happen, however, if the entire contents of the source diskette can be duplicated and stored in the system's memory.
- **You can switch to a New Source diskette.** This option is only available if **Same Source** automatically is selected.

Note: Do not access any desk accessories when using the **Same Source** selection.

Make a valid, working copy of your *MacTest II* diskette by using the following procedure.

Materials Required

Macintosh Plus, SE, or II
800K external drive (recommended) for the Macintosh Plus or SE
MacTest Copy Program, contained on the *MacTest II* diskette
Blank 800K diskette

Backup Procedure

1. Set up the system you will be using to make copies.
2. Insert the *MacTest II* master diskette into drive one (right), and power on the system.

Note: An error message will appear if you are using anything other than a Macintosh II. It will warn you that this computer is not a Macintosh II and that this test works only with a Macintosh II. **Ignore the message** and click on **OK**. The desktop will appear.

3. Open the **MacTest Copy Program** icon.
 - The **Source Drive** should have the original diskette installed.
 - The **Destination Drive** should have a blank diskette installed.

Note: The drive configuration for the Macintosh Plus or the Macintosh SE is reflected under **Source** and **Destination** in the window.

The following window will appear if you are using a Macintosh II.

MacTest™ Disk Copy Program

Source Drive

Destination Drive

☐ Same Source

☐ New Source

☒ Right

☐ Left

☐ Right

☒ Left

Tracks read

Tracks written

Comments:

Insert write-protected source disk in right drive

Insert write-enabled destination disk in left drive

STOP

4. Follow the instructions on the screen to make a copy.

5. Upon completion, you have two choices:

a) If you wish to make additional copies:

1) Follow the instructions on the screen.

The program will make another copy.

2) Repeat this process until you have the number of copies you need.

b) If you wish to quit making copies:

1) Pull down the **File** menu and select **Quit**.

2) Insert the *MacTest II* diskette, as instructed in the dialog box.

The desktop will return.

You now have a copy of the *MacTest II* diskette. Place the original in a safe place.

Using Your Backup Diskette

Take the following precautions when using your *MacTest II* diskette copy:

- **Use the MacTest Copy Program for making all backup copies of MacTest diskettes.** If you do not, the copy will not work correctly.
- **Do not write-protect your working copy of the MacTest II diskette.** The program will not run correctly if you do.
- **Do not replace the system or finder provided on the MacTest II diskette.** The versions used on the diskette are Finder 5.4 and System 4.1. *MacTest II* is not guaranteed to work with other versions.
- **Do not change the name of the diagnostic program on the diskette.** During logic board testing, the machine reboots, looks for, and restarts the diagnostic named *MacTest II*. If the name has been changed, the startup routine will not be able to locate it, and the system will stay on the desktop.

Therefore, if the *MacTest II* window does not reappear after a logic board test, check the name of the diagnostic's icon on the desktop. Correct it to *MacTest II*, then select **Set Startup** from the desktop **Special** menu. When you are asked if you wish to change the name of the startup application to *MacTest II*, click **OK**. Then double-click on the corrected *MacTest II* icon to return to the test program.

□ RUNNING *MACTEST II*

What if...

If any of the following problems are encountered, refer to Section 4, Troubleshooting, for additional information.

- The known-good *MacTest II* diskette will not boot.
- The **Configuration** window indicates there is no interface card installed in any slot, and there is.
- The **Configuration** window indicates there are no disk drives installed, and there are.
- The Macintosh II system intermittently locks up during the logic test.
- The **Configuration** window indicates the wrong amount of RAM installed.

Materials Required

MacTest II diagnostic diskette (backup)
Mini DIN-8 to mini DIN-8 Serial Port Cable
SCSI Loopback Test Card (modified with jumper—see "SCSI Loopback Jumper Procedure")
Blank formatted 800K diskette for left drive test, if left drive is installed

Installing the Loopbacks

Before beginning *MacTest II*, and **with the power off**, connect the serial loopback cable, the SCSI loopback card, the keyboard, the mouse, the video interface card, and the monitor.

CAUTION: *Always power off the system when you connect or disconnect the SCSI loopback card.*

The SCSI loopback card cable must be connected to the SCSI port on the back of the Macintosh II. (No other connections between the card and the Macintosh II are necessary.) To protect the SCSI circuitry, you must have the power off when you connect the SCSI card. The loopback cable with the mini DIN-8 connectors must be installed between the two serial ports on the rear of the machine.

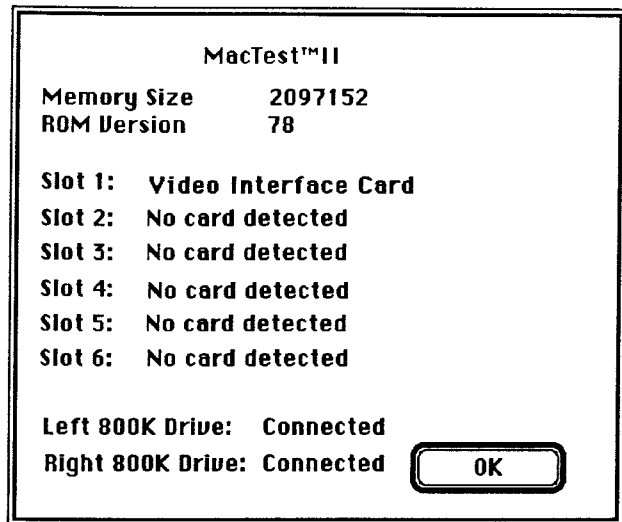
Using the *MacTest II* Menus

Insert the *MacTest II* diskette into the internal drive, and power on the system. The *MacTest II* test window will appear. The menus available from the *MacTest II* window are described below.

Options Menu

The **Options** menu contains two submenu choices:

1. **Configuration:** The following window will appear when Configuration is selected.



This window indicates the amount of memory, the version number of the ROMs, and the cards installed in slots 1 through 6 in the Macintosh II under test.

2. **Test Selections:** The following window will appear when Test Selections is selected.

☒ Logic test ☒ Video card in slot **1**
 ☒ Short ☐ Long ☒ Monitor

☒ 800K Drives
 ☐ Left ☒ Right

☐ Loop on all tests **OK** **Cancel**

- a) **Logic:** This test verifies the correct functioning of the following circuitry on the board:

- VIA (Versatile Interface Adaptor)
- Serial ports
- Clock
- SCSI bus
- Memory (RAM)

You may select a short or long logic test. The running time of these tests will vary depending on the memory size of the system. **You will need to keep track of the amount of time it is taking to run the RAM test, because there is no moving or flashing indicator that the system is running.** The approximate times for the various memory configurations are given below.

<u>Memory Size</u>	<u>Short</u>	<u>Long</u>
1M	2-minutes	12-minutes
2M	4-minutes	25-minutes
4M	8-minutes	50-minutes
5M	10-minutes	62-minutes
8M	16-minutes	100-minutes

- b) **800K Drives:** You may test any or all of the drives (except hard disk drives):
- Right (one)
 - Left (two)
- c) **Video Card:** You must enter the slot that the card is installed in.

The **Monitor** selection provides three test patterns: a grid, a white screen, and color or gray bars.

Note: Refer to *Apple High-Res Monochrome Monitor Technical Procedures* or *Apple-High Res RGB Monitor Technical Procedures* for information about any necessary adjustments.

- d) **Loop on all tests:** This selection provides continuous running (in sequence) of all selected tests except the **Monitor**. To stop the looping, click the **Stop** box between tests (that is, when the screen displays an arrow rather than a wristwatch).

To select a test, click in the box next to the name of the item to be tested. The box will display an X. To deselect the test, click again in the box to remove the X. When you have selected all the tests you wish, click in the **OK** box. You will be returned to the *MacTest II* window.

File Menu

The **File** menu allows you two choices:

1. **Save Test Selections:** Allows you to customize your *MacTest II* diskette by saving your selection of tests for the next time you use *MacTest II*. The default configuration is the short logic test and right (one) drive test.

IMPORTANT: *The diskette must be write-enabled before you save your selections.*

2. **Quit:** Returns you to the desktop.

Apple Menu

The Apple (🍏) menu allows you to access the **Key Caps** desk accessory to check the operation of the Apple DeskTop Bus keyboard. When selected, **Key Caps** displays a window with a keyboard. Press each key on the keyboard and verify that the display block for that key is highlighted. If the key is not highlighted, the keyswitch is bad and the keyswitch should be replaced. If numerous keys are not highlighted, exchange the keyboard.

Running the Tests

After you have used the **Test Selections** window to specify the tests you wish to run, you are ready to start *MacTest II*. Click on the **Start** box in the *MacTest II* window. The testing will begin. Please note the following:

- The **Status** line at the bottom of the *MacTest II* screen will keep you informed of the tests being performed and their results.
- While running, the memory test displays a wristwatch. There is no other moving or flashing indicator that tells you the test is in progress. Check the amount of RAM installed on the logic board, and keep track of the time that the RAM test is running. If it takes too long, the machine has locked up.
- If the SCSI loopback card is missing or improperly installed, you will be instructed at once to turn off the power, disconnect all external SCSI drives, and connect the SCSI loopback card.
- If the serial loopback cable is missing or improperly installed, the testing will begin, but the serial ports test will fail. You will be instructed to make sure the serial loopback cable is connected, then to click on **Continue** to retry the failed test. (You can connect the serial loopback cable without powering off the system.)

- You may halt the testing by clicking on **Stop** or **Pause** any time between tests (that is, when the screen displays an arrow rather than a wristwatch).
 - Choose **Stop** to halt the testing and to return to the **Waiting for Start** state. Choose **Start** when you wish to begin the testing sequence again.
 - Choose **Pause** if you wish to discontinue testing temporarily. Choose **Continue** to resume the tests from the point of interruption.

Replace any module that the test indicates is faulty. Then run *MacTest II* again to make sure the problem has been corrected. If the system is still not operating properly, turn to Section 4, Troubleshooting, for more information.

If all tests pass, the Macintosh II will return to the *MacTest II* window. The message **All tests have passed.** **Waiting for Start** will be displayed on the **Status** line.

□ DIAGNOSTIC SOUND SAMPLER

Introduction

The **Diagnostic Sound Sampler** enables you to listen and become familiar with the Macintosh II error chords. Error chords are brief, musical tones that indicate whether the system is functioning correctly or if there is a hardware problem.

Refer to Section 4, Troubleshooting, for complete information on startup and error chords.

Materials Required

Known-good Macintosh II system
MacTest II diskette (backup)

1. Set up the Macintosh II system.
2. Insert the *MacTest II* backup diskette. A window will appear telling you to connect a SCSI loopback card.
3. Click **OK**. The desktop will appear.
4. Open the **Diagnostic Sound Sampler**. A window listing the various chords and chord sequences will be displayed. Select the ones you wish to hear.
5. On completion, click **Quit**.

❑ SCSI LOOPBACK JUMPER PROCEDURE

To Determine If a Jumper Is Needed

To be used with *MacTest II*, the SCSI loopback card must be jumpered between Pin 25 of J1 and Pin 14 of RP1. On new SCSI loopback cards, the jumper has been etched into the printed circuit. Only cards with the old PCB artwork need the jumper procedure.

Note: This modification does not interfere with the card's use on other Macintosh or Apple II family systems, except that to work on Apple II systems it must be connected to a notched mouse cable. (For further information on the notched cable, refer to *SCSI Hard Disk Drives Technical Procedures*, Appendix A, "SCSI Interface Card.")

To Identify a New Card

To determine if you have a new card, which will not need to be jumpered, look at the back of the card. If the jumper is included in the artwork, there will be an **A** instead of double zeros (**00**) at the end of the part number, which is located under the words "APPLE COMPUTER" (Figure 1, #1). **These new cards do not have to be jumpered.**

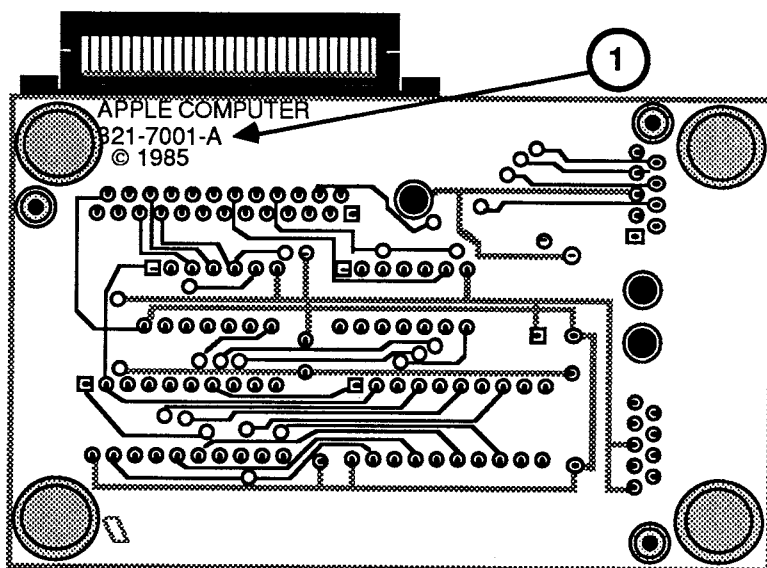


FIGURE 1

External Jumpers on Old Cards

Some cards with the **00** part number and the old artwork were modified with an external jumper during the manufacturing process. Therefore, if your card has a **00** part number, check to see if it has an external jumper from Pin 25 of J1 to Pin 14 of RP1 (Figure 2, #1). If it has no external jumper, you must install one yourself.

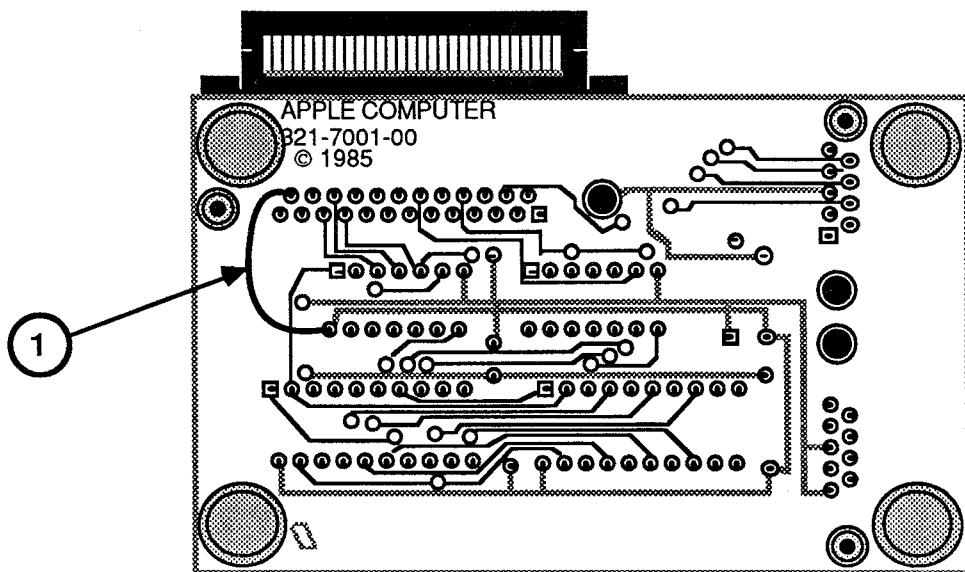


FIGURE 2

Summary

To summarize:

**If # on back
ends with:**

Do this:

A

Nothing
(Jumper is present in artwork.)

00

Check to see if external jumper
is present. If not, install jumper.

To Install the Jumper

If you find that the card must be jumpered, solder a wire connection between Pin 25 of J1 and Pin 14 of RP1, as shown in Figure 2. (The pins are not numbered on the board. In the orientation shown in Figure 2, Pin 25 is the pin closest to the upper left corner of the card, and Pin 14 is in the middle line of pins, closest to the left edge of the card.)

Macintosh II

Section 4 – Troubleshooting

□ CONTENTS

4.3	Introduction
4.3	General Information
4.3	Before You Start
4.3	Error Chords
4.3	How to Use the Symptom Charts
4.4	How to Use the Troubleshooting Flow Charts
4.4	Things to Remember
4.6	Module Exchange Information
4.6	Logic Board Configuration
4.6	Internal Hard Disk SCSI
4.7	Startup and Error Chords
4.7	Introduction
4.7	Startup Chord
4.7	Error Chords
4.9	Summary
4.10	Symptom Chart
4.10	Video Problems
4.11	Drive Problems
4.12	Peripheral Problems
4.13	Miscellaneous Problems
4.14	Macintosh II Flow Charts
4.14	Flow Chart 1
4.16	Flow Chart 2
4.18	Flow Chart 3
4.20	Flow Chart 4
4.22	Flow Chart 5
4.24	SIMM Verification
4.24	Introduction
4.24	Isolating to the Customer's SIMMs
4.25	Verification
4.26	Verification Flow Chart

...Continued on next page

4.28	Battery Verification
4.28	Introduction
4.28	Materials Required
4.29	Verification Procedure
4.30	Customer's Configuration Chart

Note: If a step is underlined, instructions for that step can be found in Section 2, Take-Apart.

□ INTRODUCTION

General Information

There are two test diskettes that may be used to test portions of the Macintosh II system:

- *MacTest™ II*
- *Macintosh Hard Disk Drive Diagnostic* (version 4.0 or higher)

Use this troubleshooting section if you are unable to boot the *MacTest II* diskette or if the diskette is unable to detect a module failure. After you repair the system, run the test diskette again to verify system operation.

Before You Start

Read the sections entitled "Things To Remember," "Module Exchange Information," "Startup and Error Chords," "SIMM Verification," and "Battery Verification" before you begin troubleshooting. **You need the information provided in these sections to troubleshoot the Macintosh II effectively.**

Error Chords

The Macintosh II executes a ROM-based self-test when powered on. If any part of the self-test fails, a sequence of chords will sound. To hear a sample of each sequence of chords, listen to the "Diagnostic Sound Sampler" on the *MacTest II* diskette. (Refer to Section 3, Diagnostics, for more information.)

How to Use the Symptom Charts

First find the symptom that most nearly describes the problem; then perform the first corrective action on the solution list. If that corrective action does not fix the problem, go to the next one. **If you replace a module and find that the problem remains, reinstall the original module before you go on to the next action.**

If the symptoms displayed by the Macintosh II are not listed in the symptom charts, or if the system is not displaying a clearly defined problem, use the "Flow Chart" section.

How to Use the Troubleshooting Flow Charts

There are five numbered flow charts for the Macintosh II. On completion of Flow Chart 1, you will be instructed to continue to the next flow chart. You continue until you complete Flow Chart 5.

Each of the flow charts includes references to notes on the opposite page. These notes provide additional instructions or referrals to other procedures.

Starting at the top of Flow Chart 1, answer the questions and proceed down the chart. When you arrive at a rectangular box containing a list of actions, perform the actions in the sequence listed. On completion, return to the preceding diamond box. **If the problem remains, reinstall the original module before you go on to the next action.**

□ THINGS TO REMEMBER

ESD

1. Follow all electrostatic discharge (ESD) precautions when working on the Macintosh II. Refer to *You Oughta Know* in the *Apple Service Technical Procedures* for additional information.

Troubleshooting Hints

2. If available, use a known-good monitor and video interface card. This will isolate the problem to the CPU, internal drives, keyboard, and mouse.
3. Before you begin troubleshooting, remove all interface cards (except the video interface card), and disconnect any external devices (printers, SCSI devices, and/or ADB devices other than the keyboard and mouse).
4. Mark each known-good SIMM module on the exchange logic board with white correction fluid or a small sticker to prevent confusion during the troubleshooting procedure.
5. Use a known-good copy of the *MacTest II* diskette.

Normal Startup Tone	6. During a normal startup sequence, a medium-pitched soft chord is emitted; then a diskette with a flashing question mark is displayed on the screen. If either of these things does not happen, refer to "Startup and Error Chords" for additional information.
System Configuration	7. To ensure that the customer gets back the same system configuration that he brings in, record the following information: • Number of internal disk drives • If one is installed, the size of the SCSI hard disk (20M, 40M 80M) • SIMM sizes • Type of MMU To make record keeping easier, you may want to copy the Customer's Configuration Chart provided later in this section.
System Software	8. Verify that the customer is using System 4.1 and Finder 5.4 (or higher). Using the wrong versions may destroy data.
Logic-Board-Only Exchange	9. When instructed to replace the logic board only : Remove the SIMMs that are included on the replacement logic board; then place the customer's SIMMs on the replacement logic board .

□ MODULE EXCHANGE INFORMATION

Logic Board Configuration

The Macintosh II logic board service exchange module is shipped with the following components installed:

- 1M RAM (four 256K SIMMs)
- HMMU

To make sure the customer always gets back the same logic board configuration that he brought in, **be sure to record the following information before you exchange any modules:**

- The amount of memory installed and the size of the SIMMs.
- Which type of Memory Management Unit is installed: the HMMU (standard) or the PMMU, which is a 68851 IC (upgrade).

At the end of this section there is a form you can use to record the customer's system configuration. Feel free to copy it for your own use.

Internal Hard Disk SCSI

The internal 20M, 40M, and 80M SCSI hard disks are shipped without the SCSI cable connected. **Be sure to keep the SCSI cables with the customer's Macintosh II system.** They are sold as a separate replacement part and are not part of any module.

The SCSI power cable is included with all the internal SCSI drive modules.

❑ STARTUP AND ERROR CHORDS

Introduction

When the Macintosh II is powered on, the ROM executes a self-test. If any part of the self-test fails, a sequence of chords will sound. To hear a sample of each sequence of chords, listen to the "Diagnostic Sound Sampler," which is included on the *MacTest II* diskette. (Refer to Section 3, Diagnostics, for more information.)

If you are unable to interpret the chords, use the flow charts and ignore the question about the startup chord on Flow Chart 1.

Startup Chord

During a normal startup sequence, a medium-pitched chord is emitted; then a diskette icon with a flashing question mark is displayed on the screen.

Error Chords

If a startup chord and additional chords sound, a blank gray screen will usually be displayed. There will always be three sequences played if an error is encountered during startup: startup chord, error chord, and test monitor chord.

Refer to the list of failure areas below, which includes a description of each error chord, the problem it indicates, and what to do to correct the problem.

Initial Failure

A short, harsh chord indicates a failure during the initial hardware self-tests. To correct the problem:

1. Exchange the logic board. (Install the customer's SIMM modules on the exchange board. Be sure you have marked the known-good SIMMs that you removed from the exchange logic board.)
2. If this doesn't work, use the customer's logic board and exchange the SIMMs only. (Refer to "SIMM Verification" in this section for complete instructions.)

If the system still does not work, you will need to verify the customer's SIMMs on the exchange logic board. (Refer to "SIMM Verification" in this section for complete instructions.)

RAM 1 and 2 Failure

A long, medium-pitched chord (RAM 1) or a medium-pitched then high chord (RAM 2) indicates a RAM self-test failure. To correct the problem:

1. Exchange only the SIMMs in Bank A. (Refer to "SIMM Verification" in this section for complete instructions.)
2. Exchange only the SIMMs in Bank B. (Refer to "SIMM Verification" in this section for complete instructions.)
3. If these exchanges do not work, exchange the logic board. (Install the customer's SIMM modules on the exchange board.)
4. If the system still does not work, you will need to do the SIMM verification with the exchange logic board.

Test Monitor

Four chords (from low to high) indicate that the system has entered the test monitor.

Summary

The following chart summarizes all the preceding information on error chords. The left column lists the chords, and the right column lists the actions to be taken.

Chord Sequences

Actions

- *Startup, Initial, Test Monitor*
 1. Replace logic board only.
 2. Perform SIMM verification on customer's logic board.

- *Startup, RAM 1, Test Monitor*
 1. Perform SIMM verification of Bank A then of Bank B on customer's logic board.
 2. Replace logic board only.
 3. Perform SIMM verification on a replacement logic board.

- *Startup, RAM 2, Test Monitor*
 1. Perform SIMM verification of Bank A then of Bank B on customer's logic board.
 2. Replace logic board only.
 3. Perform SIMM verification on replacement logic board.

□ SYMPTOM CHART

Video Problems

Solutions

- *Screen is dark, audio and drive operate, fan is running, and LED is lit*
 1. Adjust brightness on monitor.
 2. Replace monitor.
 3. Replace video cable.
 4. Move video interface to a different slot.
 5. Replace video interface card (refer to Section 5, Additional Procedures).
 6. Replace SIMMs (refer to "SIMM Verification").
 7. Replace logic board.
 8. Replace power supply.
- *Screen dark, no audio, no drive, but fan is running and LED is lit*
 1. Replace video cable.
 2. Move video interface to a different slot.
 3. Replace video interface card (refer to Section 5, Additional Procedures).
 4. Replace SIMMs (refer to "SIMM Verification").
 5. Replace logic board.
 6. Replace power supply.
 7. Replace monitor.
- *Partial or whole screen is bright and audio is present, but no video information is visible*
 1. Replace monitor.
 2. Replace video cable.
 3. Move video interface to a different slot.
 4. Replace video interface card (refer to Section 5, Additional Procedures).
 5. Replace logic board only.
- *Screen is completely dark, fan is not running, and LED is not lit*
 1. Plug the monitor directly into the wall socket, and verify that the monitor has power.
 2. Check batteries (refer to "Battery Verification").
 3. Replace power supply.
 4. Replace logic board only.

Note: If replacing the monitor will correct the problem, refer to the *Technical Procedures* to get replacement information.

Drive Problems

Solutions

- *Audio and video present, but one internal 800K drive does not operate*
 1. Replace bad diskette.
 2. Verify that all external SCSI devices are disconnected.
 3. Replace internal disk drive cable.
 4. Replace internal disk drive.
 5. Replace logic board only.
 6. Replace power supply.

- *Audio and video present but neither internal 800K drive operates*
 1. Replace bad diskette.
 2. Verify that all external SCSI devices are disconnected.
 3. Replace power supply.
 4. Replace logic board only.

- *Disk ejects; display shows icon with blinking "X"*
 1. Replace diskette with known-good system diskette.
 2. Replace internal disk drive cable.
 3. Replace internal disk drive.
 4. Replace logic board only.

- *Will not eject diskette*
 1. Power off system and hold mouse button down while powering on.
 2. Replace disk drive.

- *Attempts to eject diskette, but doesn't*
 1. Reinsert diskette.
 2. Reseat top cover so drive slots line up correctly.

- *Internal disk drive runs continuously*
 1. Replace bad diskette.
 2. Replace internal disk drive cable.
 3. Replace internal disk drive.
 4. Replace logic board only.

- *Internal hard disk will not operate*
 1. Replace SCSI cable connector.
 2. Replace SCSI power connector.
 3. Replace hard disk.
 4. Replace logic board only.

Peripheral Problems

Solutions

- *Cursor does not move*
 1. Check mouse connection.
 2. If mouse was connected to keyboard, connect it to a rear ADB port instead. If mouse works, keyboard should be replaced.
 3. If mouse does not work in any ADB port, replace mouse.
 4. Replace logic board only.
- *Cursor moves but clicking the mouse button has no effect*
 1. Replace mouse.
 2. Replace logic board only.
- *No response to any key on the keyboard*
 1. Check keyboard connection to ADB port.
 2. Replace keyboard cable.
 3. Replace keyboard.
 4. Replace logic board only.
- *Known-good ImageWriter or ImageWriter II will not print*
 1. Make sure System 4.1 and Finder 5.4 (or higher) are used.
 2. Make sure that the Chooser and the Control Panel are set correctly.
 3. Replace printer interface cable.
 4. Replace logic board only.
- *Known-good LaserWriter will not print*
 1. Make sure System 4.1 and Finder 5.4 (or higher) are used.
 2. Make sure that the Chooser and the Control Panel are set correctly.
 3. Refer to the *Networks* tab in the *Apple Technical Procedures* for more information.

Miscellaneous Problems

Solutions

- *Clicking, chirping, or thumping sound*
 1. Replace power supply.
 2. Replace logic board only.

- *System shuts down intermittently*
 1. Make sure air vents on sides and top of main unit are kept clear. Thermal protection circuitry may shut the system down. After 30 to 40 minutes the system should be OK.
 2. Replace power cable.
 3. Check batteries (refer to "Battery Verification").
 4. Replace power supply.
 5. Replace logic board only.

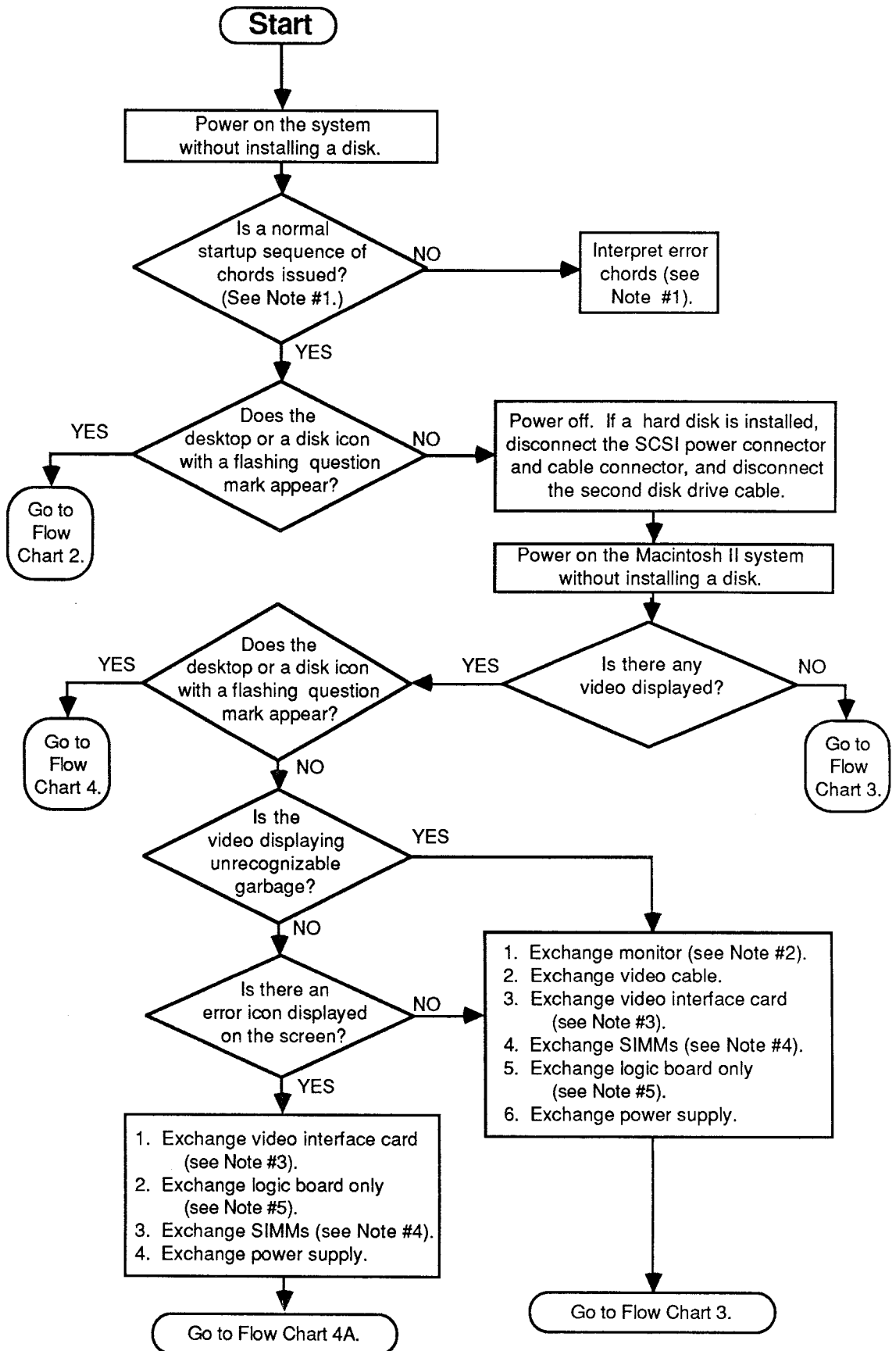
- *System intermittently crashes or locks up*
 1. Make sure System 4.1 and Finder 5.4 (or higher) are being used.
 2. Make sure software is known-good.
 3. Replace logic board only.
 4. Replace SIMMs (refer to "SIMM Verification").
 5. Replace power supply.

- *No sound from speaker*
 1. Verify that the volume setting in the Control Panel is set to one or above.
 2. Replace speaker.
 3. Replace logic board only.

□ MACINTOSH II FLOW CHARTS

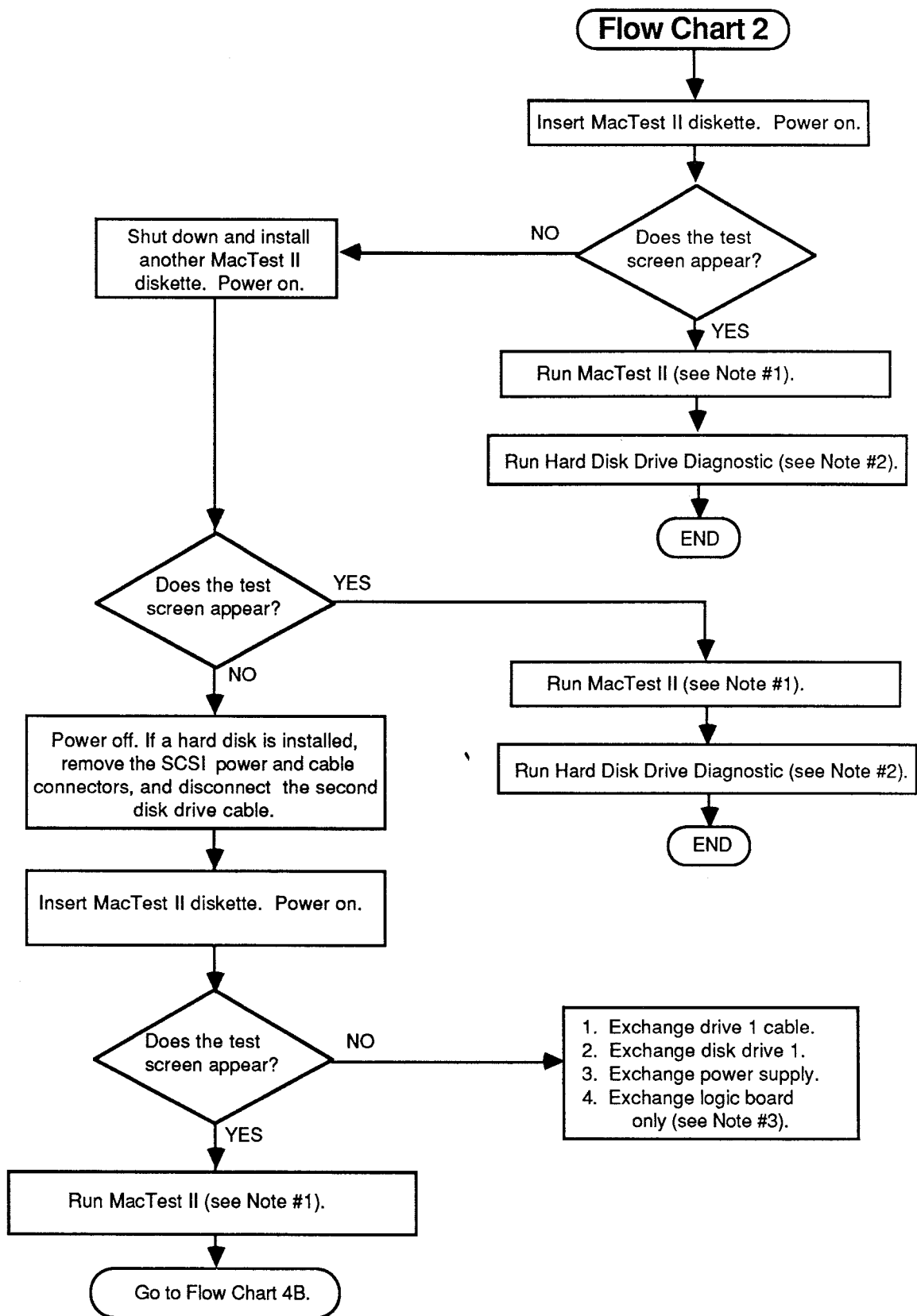
Flow Chart 1

1. During a normal startup sequence a medium-pitched soft chord is emitted; then a disk icon with a flashing question mark is displayed on the screen. If either of these things does not happen, refer to "Startup and Error Chords" for additional information. If you cannot interpret the chords, continue with the flow chart.
2. If exchanging the monitor will correct the problem, refer to the *Apple High-Res Monochrome Monitor Technical Procedures* or *Apple High-Res RGB Monitor Technical Procedures* to isolate the monitor problem to the module level.
3. If exchanging the video interface card corrects the problem, and if the customer's card has the video expansion kit installed, refer to Section 5, Additional Procedures, for information on troubleshooting the eight replaceable RAMs.
4. There are two steps to perform when exchanging the SIMM modules. Refer to "SIMM Verification" for complete instructions on verifying and troubleshooting the SIMMs.
5. If the known-good SIMMs did not correct the problem, install the **customer's SIMMs** on the **replacement logic board**.



Flow Chart 2

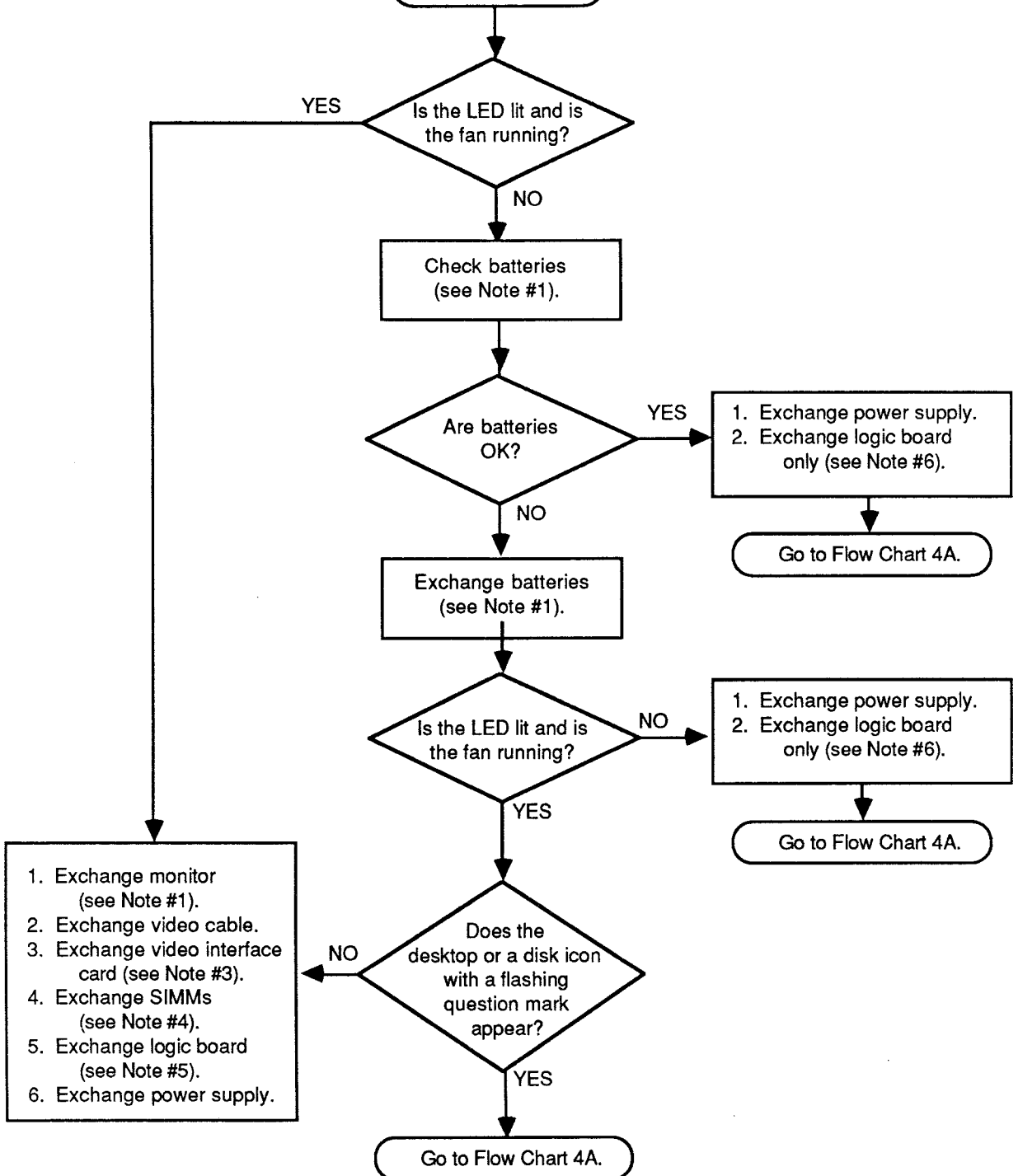
1. Refer to Section 3, Diagnostics, for complete information.
2. Refer to *SCSI Hard Disk Drives Technical Procedures* for complete instructions.
3. Install the **customer's SIMMs** on the **replacement logic board**.



Flow Chart 3

1. Refer to "Battery Verification" for complete instructions on checking the lithium batteries.
2. If exchanging the monitor will correct the problem, refer to the *Apple High-Res Monochrome Monitor Technical Procedures* or *Apple High-Res RGB Monitor Technical Procedures* to isolate the monitor problem to the module level.
3. If exchanging the video interface card corrects the problem, and if the customer's card has the video expansion kit installed, refer to Section 5, Additional Procedures, for information on troubleshooting the eight replaceable RAMs.
4. There are two steps to perform when exchanging the SIMM modules. Refer to "SIMM Verification" for complete instructions on verifying and troubleshooting the SIMMs.
5. If the known-good SIMMs did not correct the problem, install the **customer's SIMMs** on the **replacement logic board**.
6. Exchange only the logic board by installing the **customer's SIMMs** on the **replacement logic board**.

Flow Chart 3



Flowchart 4

1. Refer to Section 3, Diagnostics, for complete information.
2. Install the **customer's SIMMs** on the **replacement logic board**.

Flow Chart 4A

Insert MacTest II diskette. Power on.

Does the test screen appear?

NO

1. Exchange drive 1 cable.
2. Exchange disk drive 1.
3. Exchange power supply.
4. Exchange logic board only (see Note #2).

YES

Run MacTest II diskette (see Note #1).

Power off. Reconnect the 2nd drive (if installed). Power on.

Flow Chart 4B

Does the desktop or a disk icon with a flashing question mark appear?

NO

1. Exchange drive 2 cable.
2. Exchange disk drive 2.
3. Exchange power supply.
4. Exchange logic board only (see Note #2).

YES

Insert MacTest II diskette. Power on.

Does the test screen appear?

NO

1. Exchange drive 2 cable.
2. Exchange disk drive 2.
3. Exchange power supply.
4. Exchange logic board only (see Note #2).

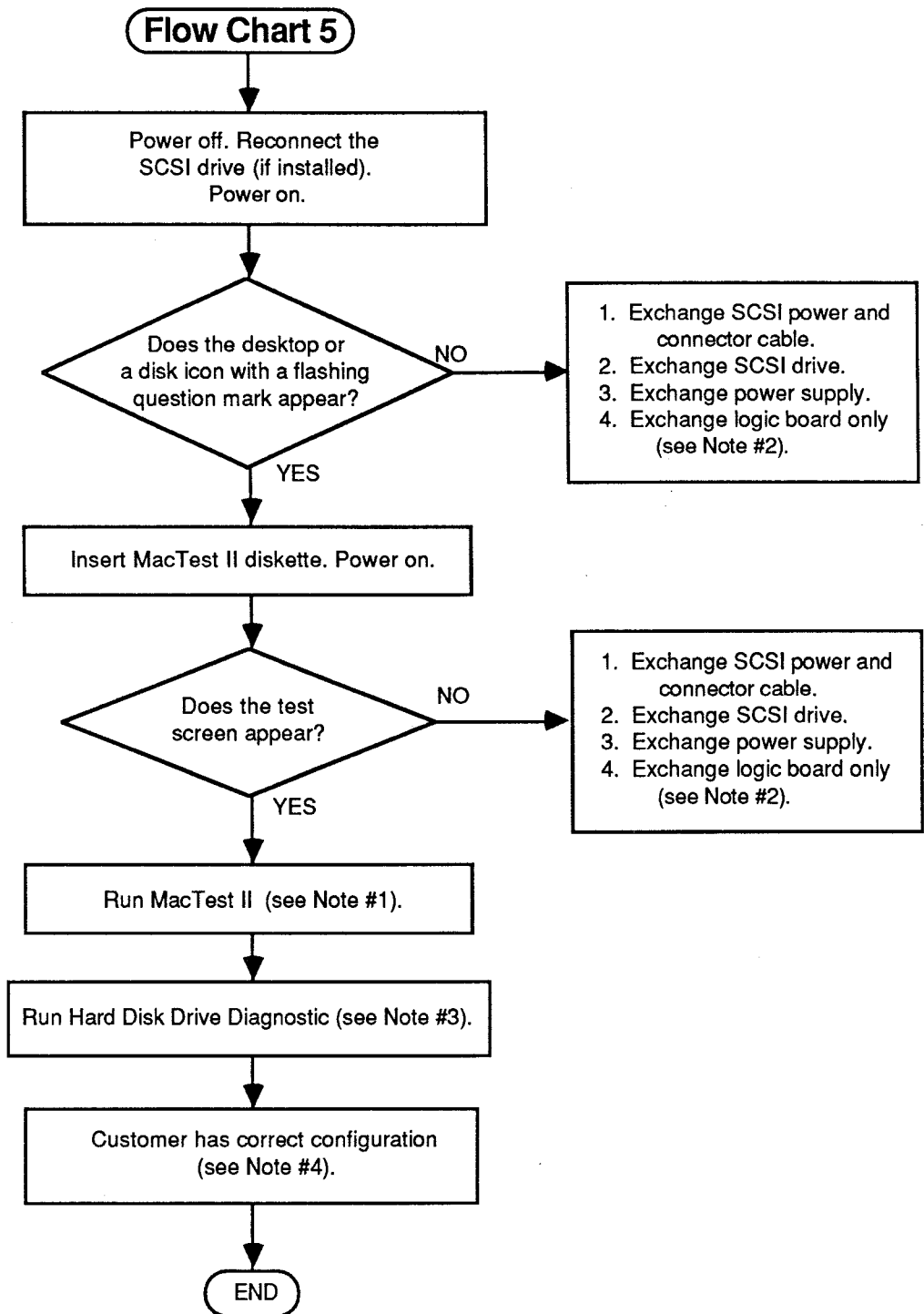
YES

Run MacTest II (see Note #1).

Go to Flow Chart 5.

Flow Chart 5

1. Refer to Section 3, Diagnostics, for complete information.
2. Refer to *SCSI Hard Disk Drives Technical Procedures* for complete instructions.
3. Install the **customer's SIMMs** on the **replacement logic board**.
4. The customer must always get back the same system configuration he brings in. Refer to "Module Exchange Information."



□ SIMM VERIFICATION

Introduction

The service exchange logic board comes with four 256K SIMMs. Mark each known-good SIMM with a dot of white correction fluid or a small sticker. Whatever you use, be sure it will not come off while you are testing.

The SIMMs that are installed on the customer's logic board may be defective. To verify this you will be removing all of the customer's SIMMs and installing the known-good SIMMs.

Isolating to the Customer's SIMMs

1. Remove the top cover.
2. Remove the drive mount.
3. Remove the customer's SIMMs.

Note: Using the configuration chart, record the number and the sizes of the SIMMs. The customer should get the same number and sizes back! Refer to Section 5, Additional Procedures, for information on identifying the SIMMs.

4. Install the four known-good 256K SIMMs in Bank A (Figure 1, #1).
5. Place the drive mount into position, and connect drive one only.
6. Power on the system.
7. Insert the *MacTest II* diskette.

If the test boots, run it. Then continue with the appropriate verification procedure.

If the test does not boot, return to the appropriate flow chart.

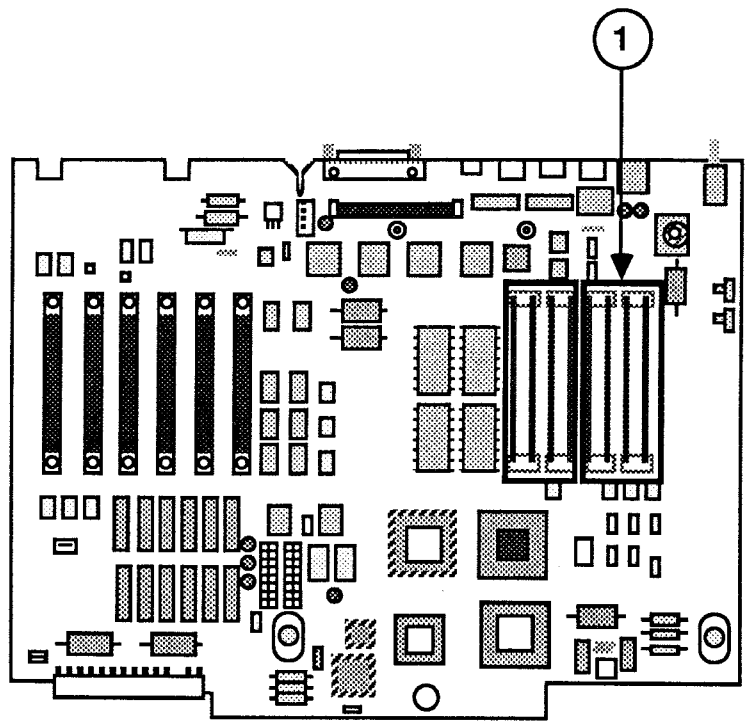


FIGURE 1

Verification

If the customer has 256K SIMMs or 1M SIMMs installed, you will need to verify all of them. Use the flow chart and referenced notes on the next two pages to perform the verification of the SIMMs.

Materials Required

If verifying 256K SIMMs, you will need four 256K known-good SIMMs.

If verifying 1M SIMMs, you will need four 1M known-good SIMMs

**Verification
Flow Chart
Notes**

1. Locate Bank A on the logic board and install three known-good SIMMs (Figure 2, #1).
2. During a normal startup sequence, a medium-pitched soft chord is emitted; then a disk icon with a flashing question mark is displayed on the screen. If either of these things does not happen, refer to "Startup and Error Chords" for additional information.
3. Be sure to set the defective SIMM where it will not be mixed up with the others.
4. Return to the beginning of the flow chart and perform the same procedure for Bank B (Figure 2, #2).

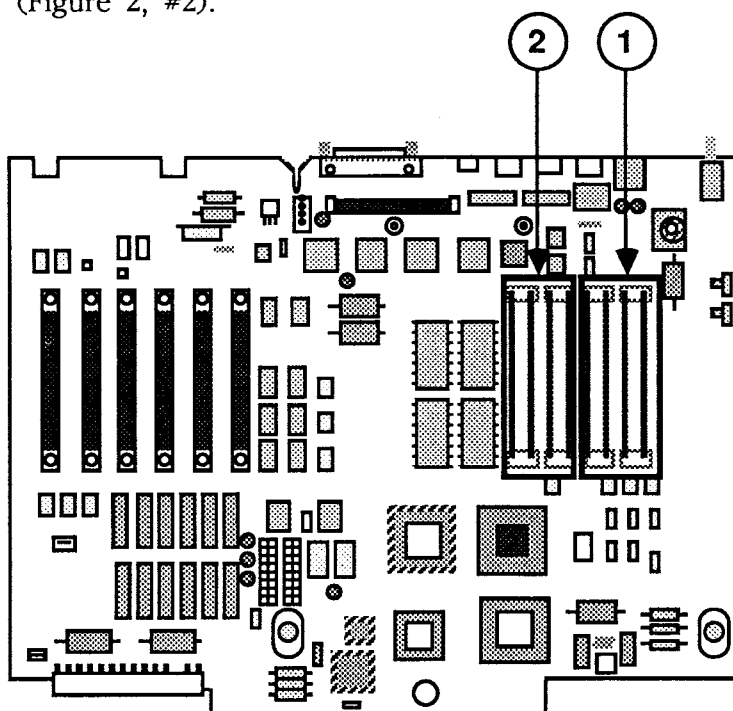
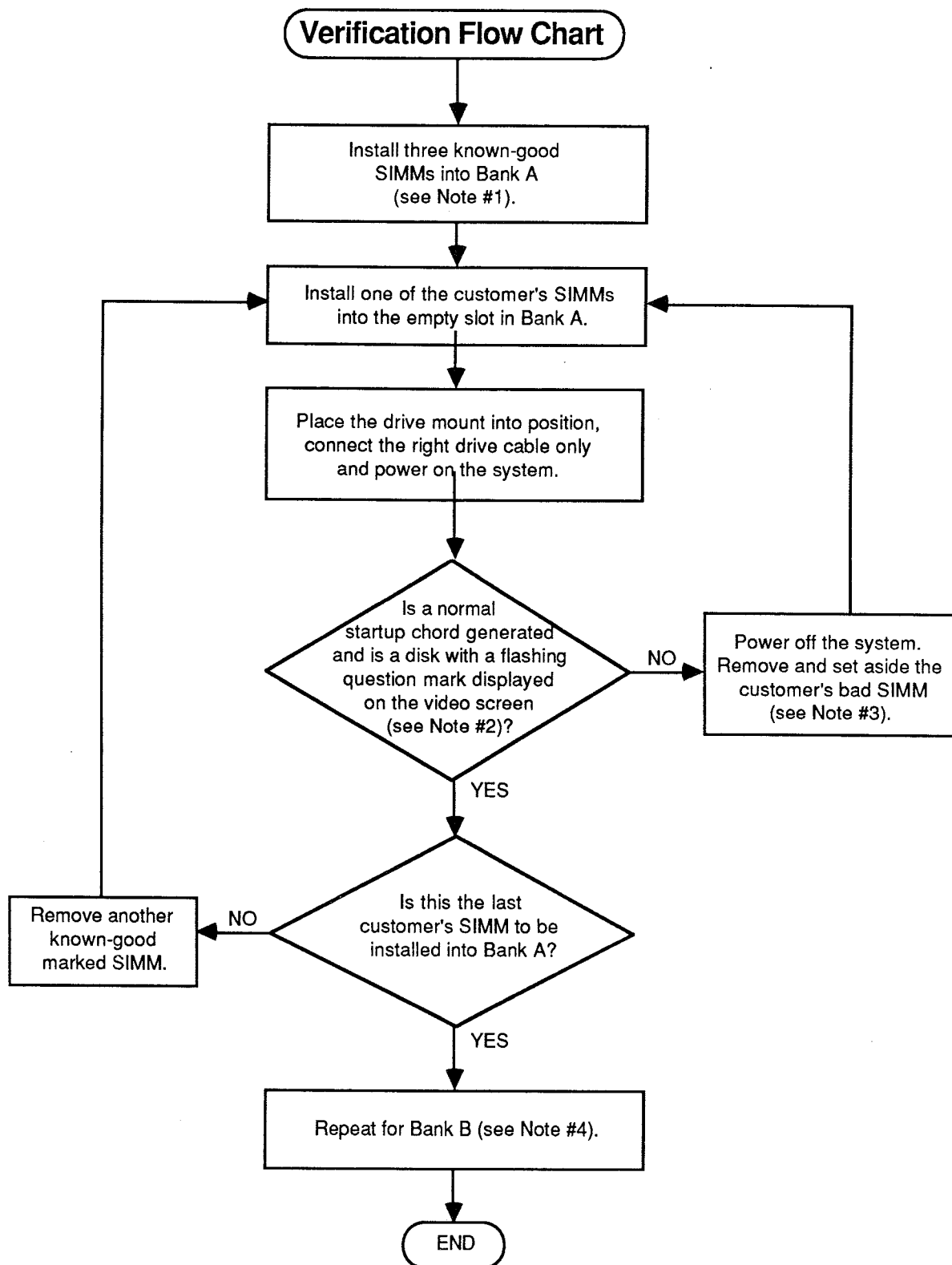


FIGURE 2



❑ BATTERY VERIFICATION

Introduction

There are two lithium batteries on the Macintosh II logic board. These batteries are part of the power-on circuit. If either battery falls below specifications, **both** must be removed and replaced.

WARNING: *Lithium batteries, the type used in the Macintosh II, have some potential for explosion if improperly handled. Follow the procedure below exactly as written.*

Materials Required

Voltmeter

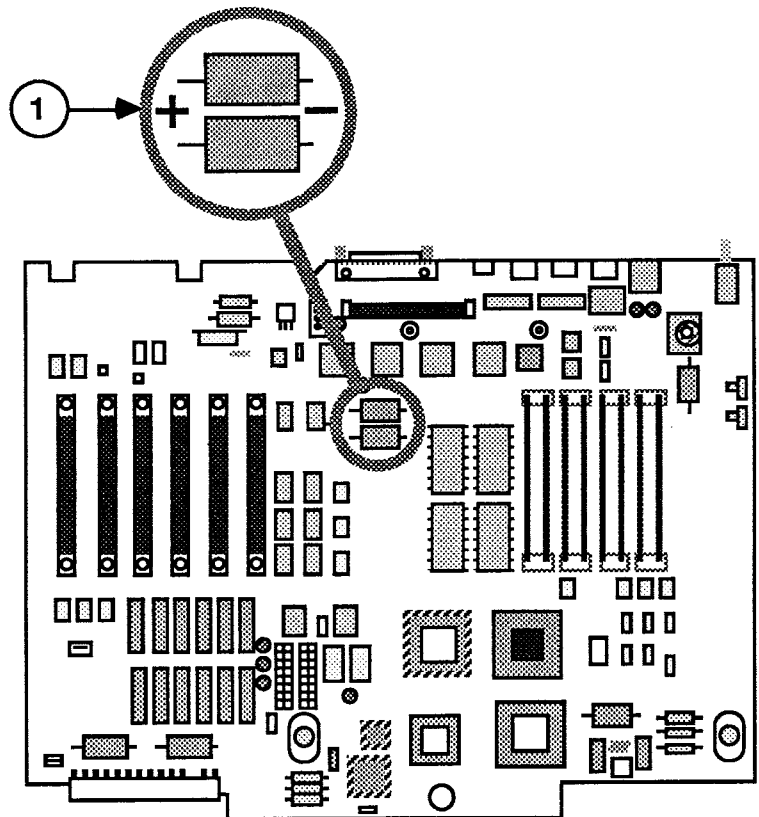


FIGURE 3

Verification Procedure

To check the lithium batteries with a voltmeter:

1. Be sure power is off. Then remove the top cover of the Macintosh II.
2. Set the voltmeter range to measure 10 volts DC.
3. Touch and hold the **positive probe** of the voltmeter to the **positive side** of one of the batteries (Figure 3, #1).
4. Touch and hold the **ground probe** of the voltmeter to the **negative side** of the same battery.
5. The reading for a good battery should be **above 2.8 volts**.
6. Return to step 1 and repeat for the other battery.

If either battery falls below 2.8 volts, replace both batteries. Refer to Section 5, Additional Procedures, for replacement instructions.

❑ CUSTOMER'S CONFIGURATION CHART

The chart below can be copied and used to keep track of a customer's system configuration. Once it has been filled out, attach it to the system. This will help you make absolutely sure that the customer gets back the same configuration that he brought in.

Macintosh II Configuration			
Customer			
Serial Number			
Internal Disk Drives	1	2	
Internal Hard Disk SC	20M	40M	80M
Memory Management Unit	HMMU PMMU		
SIMMs			
Bank B	# Installed	Bank A	# Installed
256K		256K	
1M		1M	

Macintosh II

Section 5 – Additional Procedures

❏ CONTENTS

5.2	Logic Board RAM Identification and Upgrades
5.2	Introduction
5.2	Identification
5.4	Upgrades
5.6	Video Card RAM Upgrade
5.6	Introduction
5.6	Materials Required
5.6	Installation
5.6	Troubleshooting the Video RAM Upgrade
5.6	Materials Required
5.6	Procedure
5.7	Battery Replacement
5.7	Storage and Handling
5.7	Disposal
5.8	Procedure
5.9	Materials Required

Note: To perform the 800K disk drive or hard disk SCSI upgrades refer to Section 2, Take-Apart.

Note: If a step is underlined, instructions for that step can be found in Section 2, Take-Apart.

❑ LOGIC BOARD RAM IDENTIFICATION AND UPGRADES

Introduction

The RAM is provided in packages known as Single In-Line Memory Modules (SIMMs). Each SIMM contains eight surface-mounted dynamic RAM (DRAM) chips on a small, narrow, printed circuit board. Each SIMM board has contacts on one edge that fit into sockets on the motherboard.

The amount of RAM can be changed simply by installing SIMMs of differing sizes in various configurations, which will be explained later.

Identification

The SIMMs are available with two sizes of RAM, 256K and 1M.

256K SIMMs

The 256K SIMMs have 8 ICs (Figure 1). Each IC has 5 pins (or legs) on each side (Figure 1, #1).

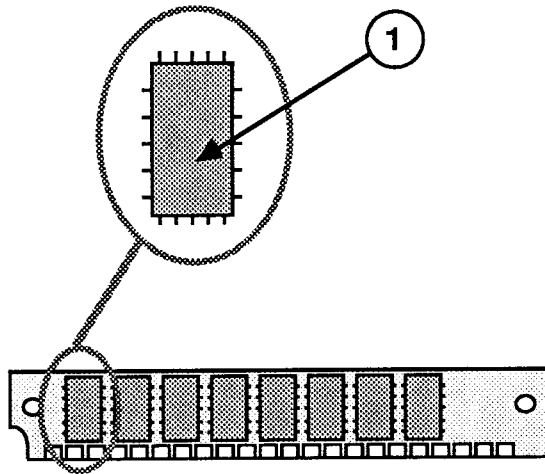


FIGURE 1

IMPORTANT: You must use 120ns 256K SIMMs on the Macintosh II. The 150ns SIMMs will cause serious timing problems.

There are two speeds of 256K SIMMs—120ns and 150ns—that are usable in the Macintosh SE. **Only the 120ns SIMMs are suitable for the Macintosh II.** You can identify a 120ns SIMM by the number 12 that is printed on the back.

1 M SIMMs

Like the 256K SIMMs, the 1M SIMMs also have 8 ICs (Figure 2, #1). But each 1M IC has 10 pins (or legs), and they are located on only two sides of the chip (Figure 2, #1). The 1M IC is also approximately 25% larger than the 256K IC.

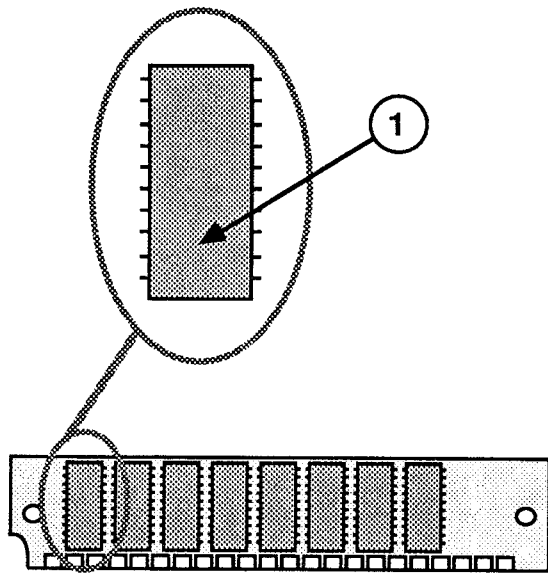


FIGURE 2

Upgrades

Various RAM upgrades are possible on the logic board, depending on the number of SIMMs you use and the size of the chips that you mount on the SIMMs.

For installation purposes, the SIMMs are labeled Bank A (Figure 3, #1) and Bank B (Figure 3, #2).

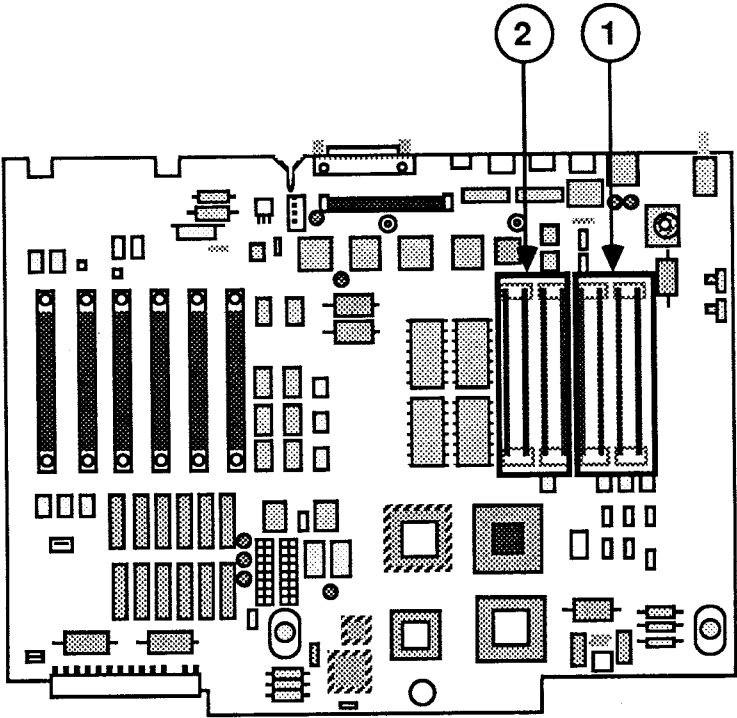


FIGURE 3

Within each bank are four slots which are grouped by twos. The slots within Bank A are labeled 1 (Figure 4, #1) and 2 (Figure 4, #2). The slots within Bank B are labeled 3 (Figure 4, #3) and 4 (Figure 4, #4).

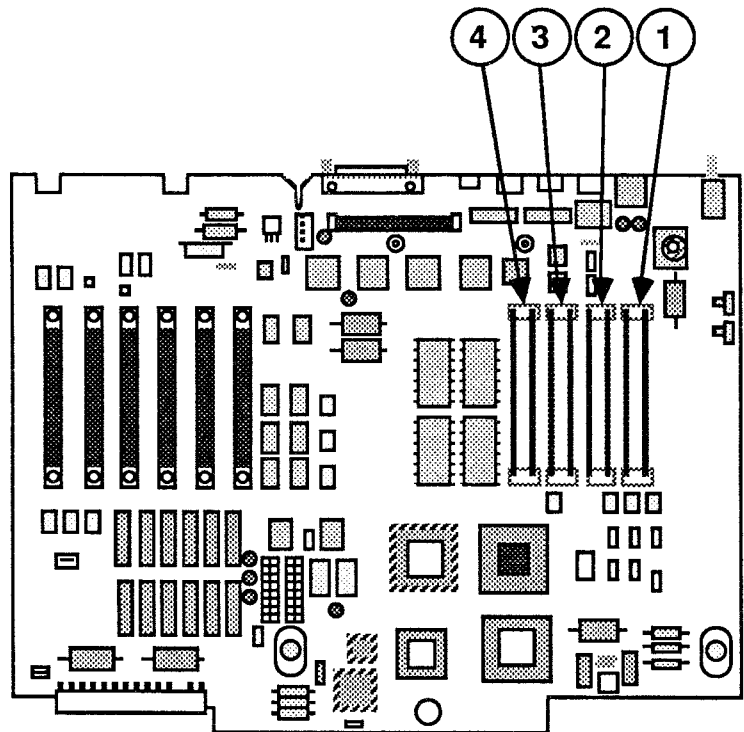


FIGURE 4

The following chart summarizes the various configurations the Mac II will support.

<u>RAM</u>	<u>Bank A (Figure 3 #1)</u>	<u>Bank B (Figure 3 #2)</u>
1M	Four 256K SIMMs	Empty
2M	Four 256K SIMMs	Four 256K SIMMs
4M	Four 1M SIMMs	Empty
5M	Four 1M SIMMs	Four 256K SIMMs
8M	Four 1M SIMMs	Four 1M SIMMs

CAUTION: Other configurations, such as a single SIMM or a pair of differently sized SIMMs, will not function correctly.

□ VIDEO CARD RAM UPGRADE

Introduction

The Macintosh II Video Card is used with both the AppleColor High-Resolution RGB Monitor and the Apple High-Resolution Monochrome Monitor. The card, as it is shipped, supports 2, 4, or 16 simultaneous colors or shades of gray. By installing the Video Card Expansion Kit (8 RAMs), the same card can display up to 256 simultaneous colors or shades of gray.

Materials Required

Grounded workbench and wriststrap
Video Card Expansion Kit (8 RAMs)

Installation

1. Install the eight new RAMs in the appropriate locations: B1, C1, D1, E1, G1, H1, G2, and H2 (Figure 5, #1).

Note: The notch at the end of each RAM should face the DB-15 connector on the rear of the card.

2. Reinstall the video interface card into the Macintosh II, and connect the monitor.
3. Insert the *MacTest II* diskette and power on the system. Open the **Control Panel**. Then select the monitor control and set the shade selection to 256. Then run the diagnostic to verify that the video RAM upgrade is functioning.

Troubleshooting the Video RAM Upgrade

A bad RAM IC on the video interface card could cause various video problems. There are eight replaceable RAMs on the card.

Materials Required

Grounded workbench and wriststrap
Eight known-good, marked, video RAMs

Procedure

1. Disconnect the monitor and remove the video card from the Macintosh II.

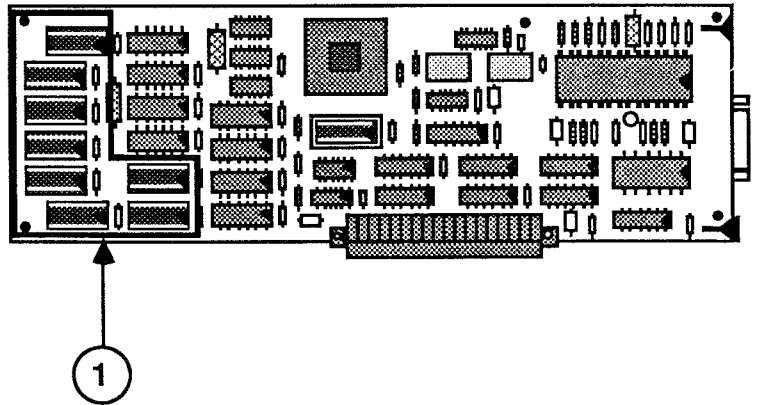


FIGURE 5

2. Remove one RAM at a time and replace it with a known-good RAM. The locations are B1, C1, D1, E1, G1, H1, G2, and H2 (Figure 5, #1).

Note: The notch at the end of each RAM should face the DB-15 connector on the rear of the card.

3. Install the video interface card into the Macintosh II, and connect the monitor.
4. Insert the *MacTest II* diskette and power on the system. Open the **Control Panel**. Then select the monitor control and set the shade selection to 256. Then run the diagnostic to verify that the video RAM upgrade is functioning.
5. Repeat from step 1 until the card functions correctly or until all the upgrade RAM has been replaced.

If the problem still exists, exchange the video interface card, install the customer's RAM and retest the card.

□ BATTERY REPLACEMENT

WARNING: *Lithium batteries, the type used in the Macintosh II, have some potential for explosion if improperly handled.*

Storage and Handling

Take the following precautions when storing and handling lithium batteries.

- When Apple's lithium batteries are shipped to you, they are sealed in individual zip-lock wrappers. When you receive them, check to make sure the wrappers are intact. If they are not, mend the wrapper before you store the batteries.
- Store the batteries in the packaging in which you receive them.
- The storage area for lithium batteries should be well marked, and access to the area should be restricted.

Disposal

Lithium batteries cannot be recharged and will require disposal when "dead." But you cannot throw them away as you would other batteries because lithium is water-reactive, in addition to being potentially explosive.

Lithium batteries must be disposed of as a hazardous waste.

WARNING: *"Dead" lithium batteries are considered hazardous waste and must be returned to Apple in their original packaging for disposal following EPA guidelines.*

Because of this hazard, Apple recommends the following course of action:

After removing a "dead" battery from a board, clip off the lead wires and place the battery in the zip-lock wrapper and original packaging from which the replacement battery was taken. Mark the battery DEAD and return it to Apple, where it will be disposed of following EPA guidelines.

Procedure

The two long-life lithium batteries in the Macintosh II should serve for the life of the product. Refer to Section 4, Troubleshooting, to check the condition of the batteries. But if the batteries should fail for some reason, replace both of them according to the following procedure.

Materials Required

- Soldering iron (60 watt, 700 degrees)
- Desoldering tool
- 60/40 resin-core solder
- Small wire cutters
- Grounded workbench and wriststrap

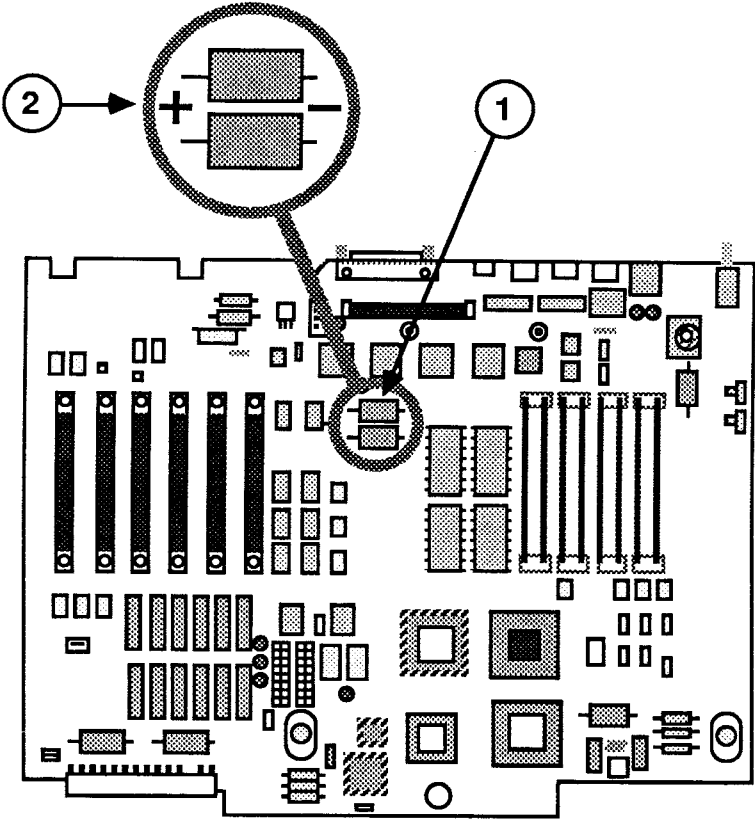


FIGURE 6

Remove

1. Remove the Macintosh II logic board from the case.
2. Locate the two batteries on the front of the logic board (see Figure 6, #1).
3. Cut the lead wires that hold one of the batteries. Then follow the disposal procedures described on the previous page.
4. Turn the logic board over. Locate the two soldered leads that held the battery in place. Apply fresh solder to the two connections.
5. Desolder the two connections, and remove the small stub of wire in both holes.
6. Repeat steps 3 through 5 for the second battery.

WARNING: *Do not force the connections free or you may remove the traces from the board. Repeat step 5 if necessary.*

Replace

1. Insert the new battery so its the positive lead is inserted into the positive-marked hole on the logic board, and so the battery is flush with the board.

CAUTION: *Be sure the positive side of the battery is in the correct location (see Figure 6, #2). Failure to do so can result in damage to the logic board.*

2. Solder the battery lead wires into place. Then clip the extra length of wire from the back of the board. (A length of about 1/16 inch is sufficient.)
3. Repeat steps 1 and 2 for the second battery.
4. Replace the logic board into the Macintosh II system.
5. Set the clock using the Control Panel.

Macintosh II

Illustrated Parts List

❑ CONTENTS

- IPL.3 System (Figure 1)
- IPL.5 Logic Board (Figure 2)
- IPL.7 Video Board (Figure 3)
- IPL.9 Keyboard (Figure 4)
- IPL.11 Extended Keyboard (Figure 5)
- IPL.13 Mouse (Figure 6)

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

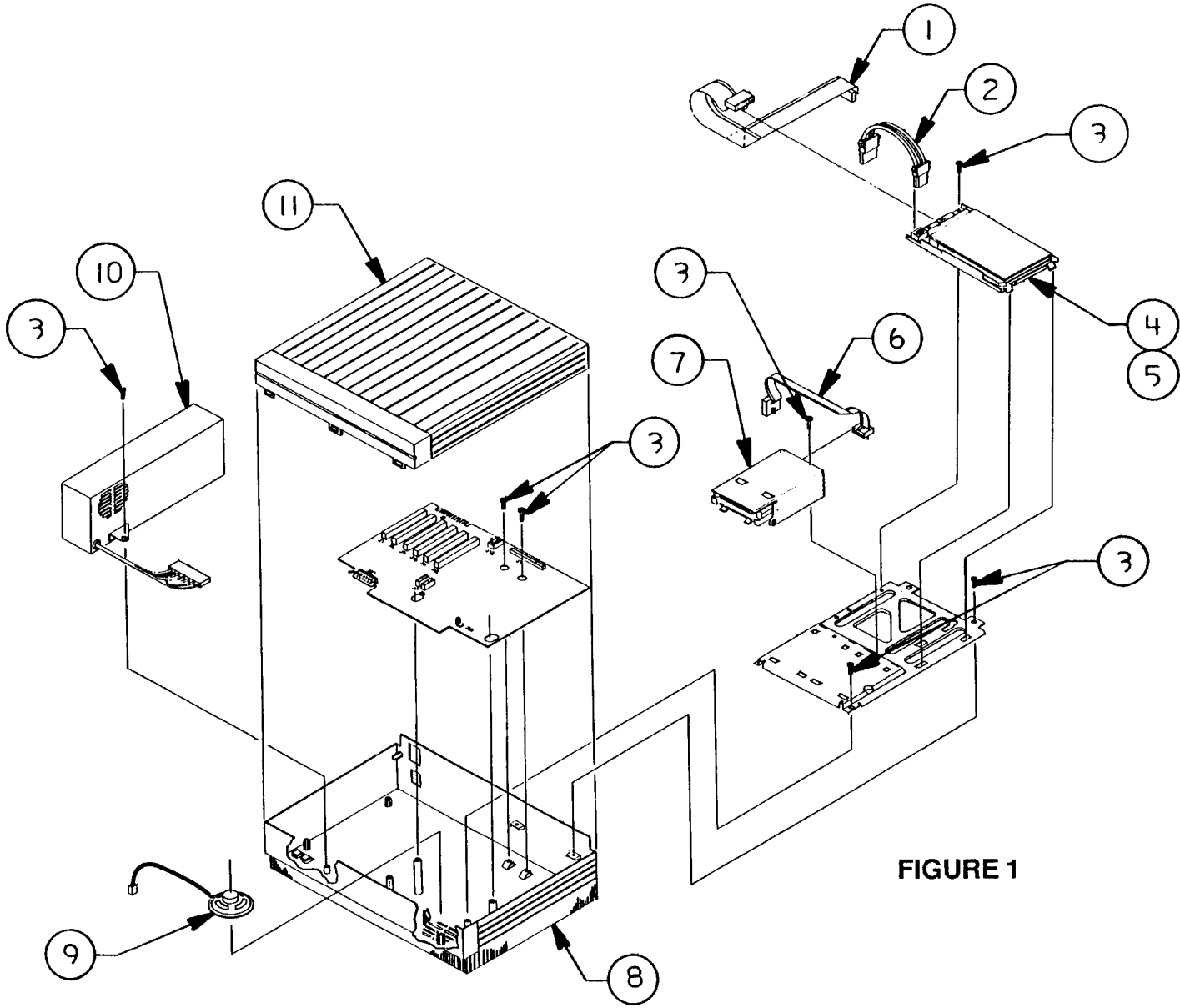


FIGURE 1

□ MACINTOSH II – SYSTEM (Figure 1)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	590-0566	Cable, Macintosh II Internal Hard Disk
2	590-0364	Cable, Internal Hard Disk Power
3	462-4100	Screws
4	661-0391	HDA, 5.25, 40M, SCSI
5	661-0373	HDA, 3.5, 20M, SCSI
6	590-0188	Cable, 3.5 Internal Drive (yellow stripe)
7	661-0345	800K Mechanism, Apple 3.5 Drive
8	630-5227	Bottom Cover Assembly
9	630-5222	Speaker
10	661-0374	Macintosh II Logic Board
11	661-0375	Macintosh II Power Supply
12	630-5229	Top Cover and Latch Assembly

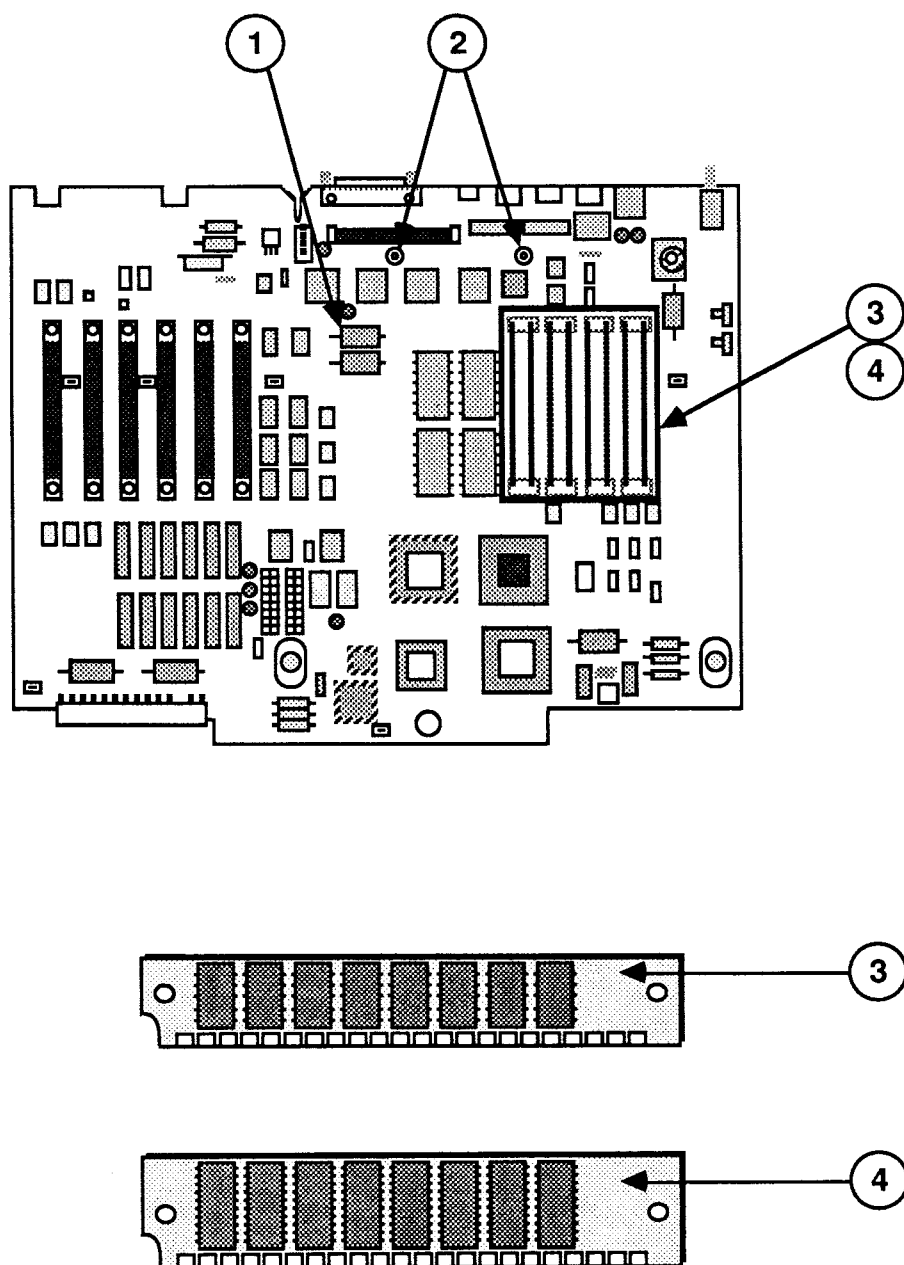


FIGURE 2

□ MACINTOSH II – LOGIC BOARD (Figure 2)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	742-0009	Battery
2	462-4100	Screws
3	661-0402	SIMM, 256K, 120 ns
4	661-0403	SIMM, 1M, 120 ns

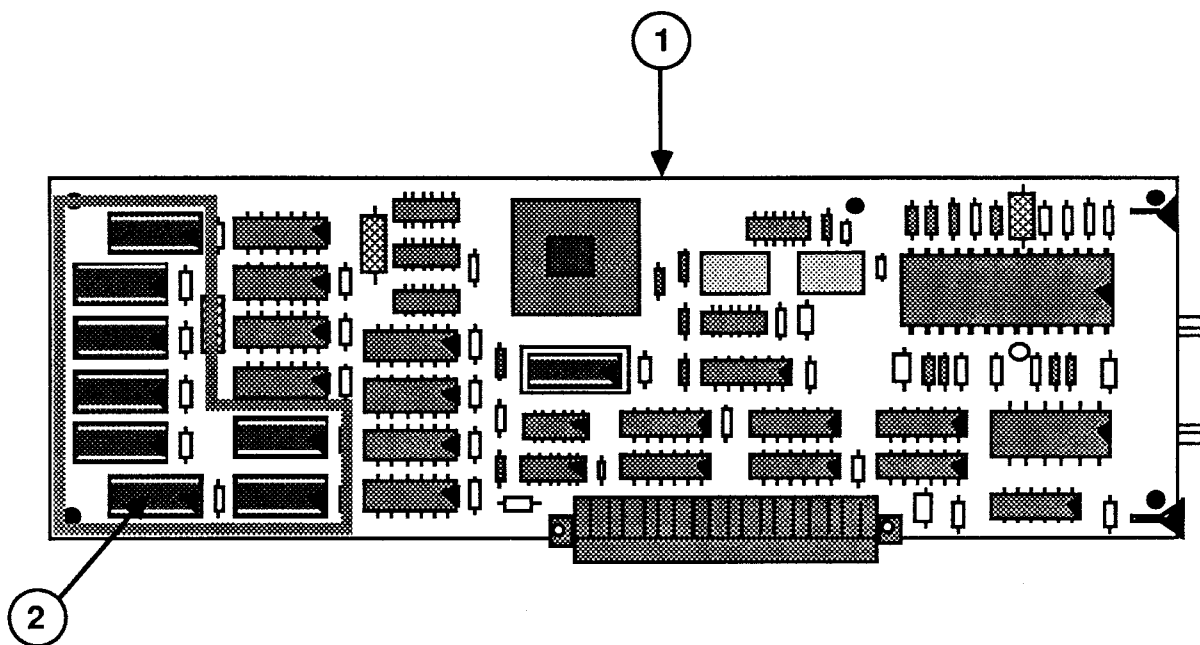


FIGURE 3

□ MACINTOSH II – VIDEO BOARD (Figure 3)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	661-0376	Macintosh II Video Card
2	334-0024	Video RAM IC, 150 ns

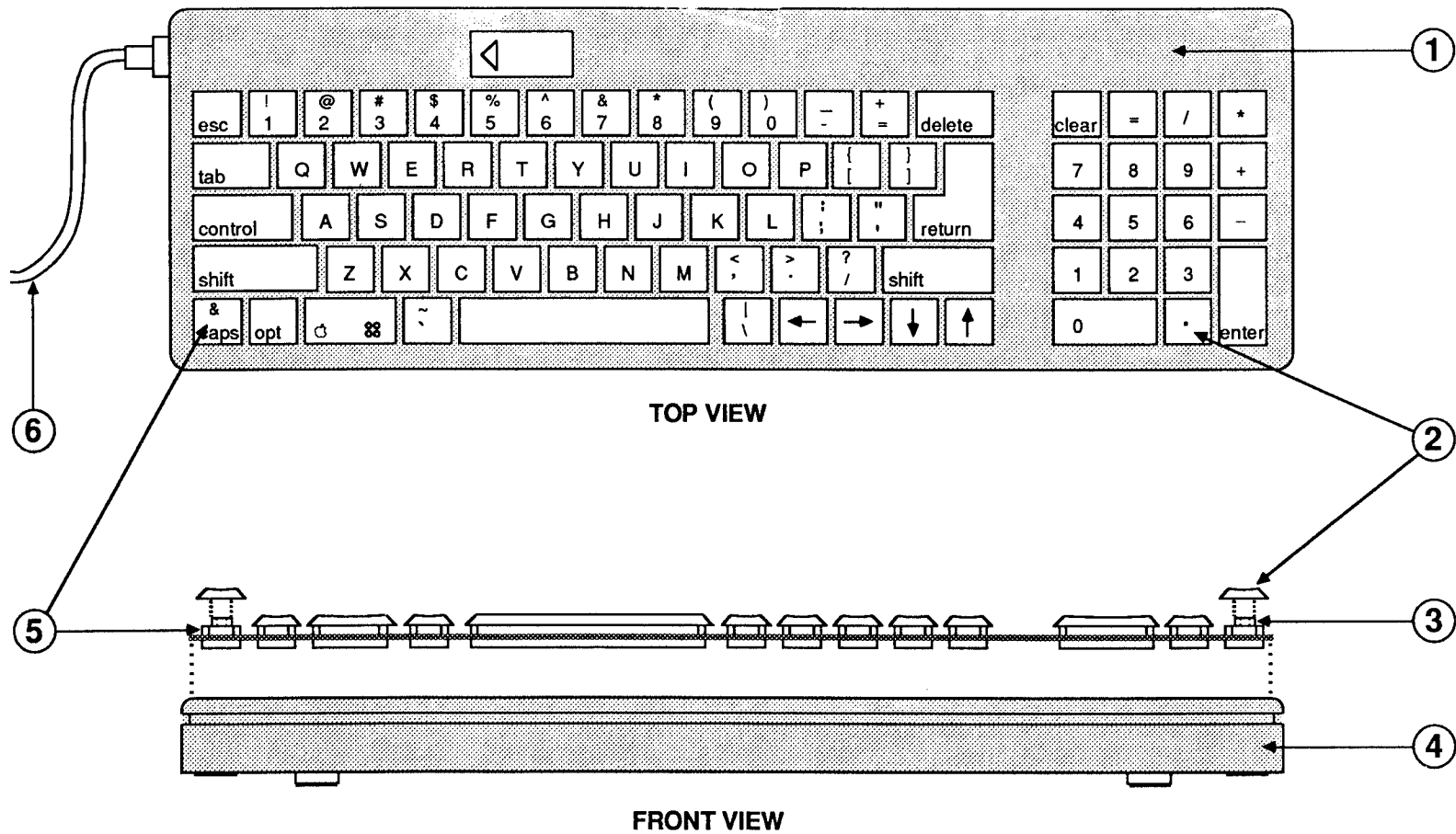


FIGURE 4

□ MACINTOSH II – KEYBOARD (Figure 4)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
-	661-0383	Apple Keyboard
1	815-1016	Top Case
2	658-7010	Key Cap Set
3	076-0209	Keyswitch Set
4	815-1017	Bottom Case
5	970-1263	Alps Locking Keyswitch
6	590-0361	Cable, Keyboard

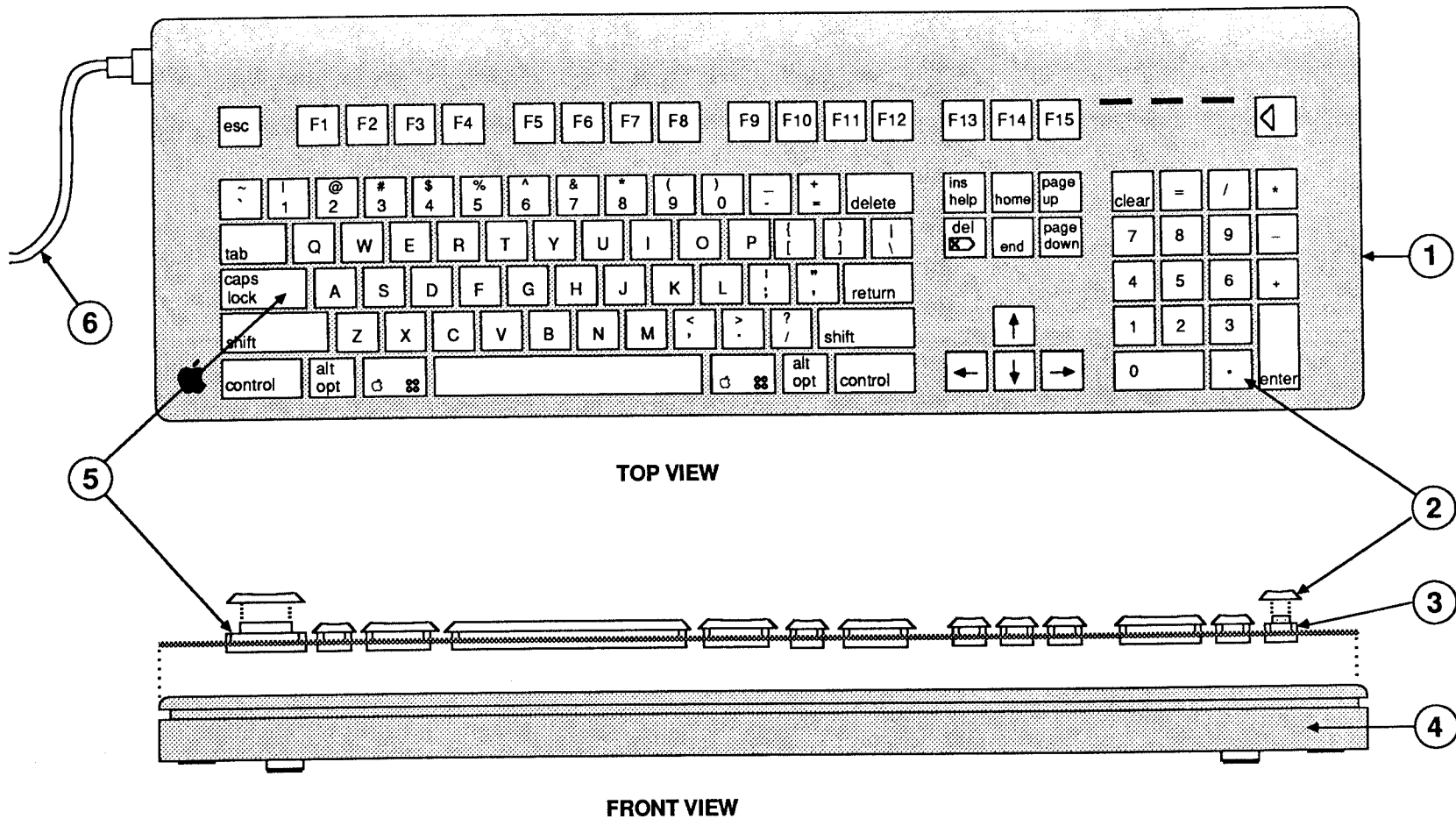


FIGURE 5

□ MACINTOSH II – EXTENDED KEYBOARD (Figure 5)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
-	661-0384	Apple Extended Keyboard
1	815-1018	Top Case
2	658-7010	Key Cap Set
3	076-0209	Keyswitch Set
4	815-1019	Bottom Case
5	970-1263	Alps Locking Keyswitch
6	590-0361	Cable, Keyboard

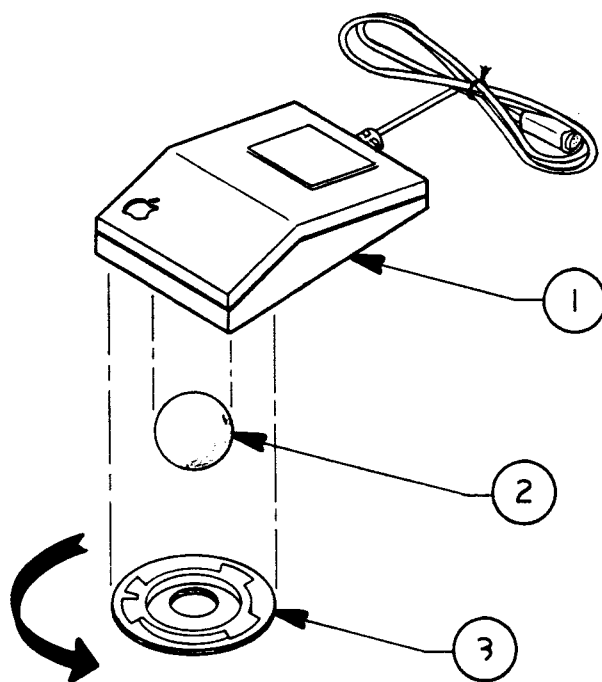


FIGURE 6

□ MACINTOSH II – MOUSE (Figure 6)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
-	661-0338	Apple Desktop Bus Mouse
1	699-8001	Rubber Coated Mouse Ball
2	076-0231	ADB Mouse Ball Retainer