

34380052  
© 1985 APPLE  
8803 CDP



Apple Service  
Technical Procedures  
Macintosh Family  
Volume One

# Macintosh SE and Macintosh SE/30

## Technical Procedures

---

### □ TABLE OF CONTENTS

<b>Section 1 – Basics</b>	1.2	Product Description
	1.2	Macintosh SE Features
	1.3	Macintosh SE/30 Features
	1.6	FDHD Disk Drive
	1.7	Connector Identification
	1.10	Internal Expansion Connectors
	1.11	Theory of Operation
	1.11	Introduction
	1.11	Main Logic Board
	1.14	Power Supply
	1.14	Analog Board
	1.14	CRT and Video Board
	1.15	Disk Drive(s)
	1.15	SCSI Hard Disk
	1.15	Apple Desktop Bus Keyboard and Mouse
	1.16	Care and Handling
 <b>Section 2 – Take-Apart</b>	 2.2	 Cover
	2.5	Discharging the Cathode-Ray Tube (CRT)
	2.5	Discharge Procedure
	2.7	Anode Cap
	2.8	Analog Board and Power Supply
	2.14	Main Logic Board
	2.16	Identifying Macintosh SE Logic Boards
	2.22	SIMMs
	2.25	Video Board
	2.28	Cathode-Ray Tube (CRT)
	2.31	Internal SCSI Hard Disk Drive
	2.31	Identifying 20SC Revision A and B Drives
	2.33	Removing the Drive From Its Carrier
	2.33	Replacing the Drive In Its Carrier
	2.35	LED Cable Assembly
	2.37	Upper Internal Disk Drive
	2.40	Lower Internal Disk Drive
	2.42	Fan Assembly
	2.46	Speaker, Front Bezel, and Slot Cover

### **Section 3 – Adjustments**

- 3.2 Yoke Adjustments
- 3.2 Introduction
- 3.2 Materials Required
- 3.3 Tilt Adjustment
- 3.3 Centering Ring Adjustment
- 3.4 Video Adjustments
- 3.4 Introduction
- 3.4 Materials Required
- 3.5 Adjustment Procedures

### **Section 4 – Diagnostics**

- 4.2 Introduction to MacTest SE and MacTest SE/30
- 4.2 Program Similarities
- 4.3 Program Differences
- 4.4 Making Backup Disks
- 4.4 Copying MacTest SE and MacTest SE/30 Disks
- 4.6 Running MacTest SE and MacTest SE/30
- 4.6 Materials Required
- 4.6 Starting MacTest SE and MacTest SE/30
- 4.8 Installing the Loopbacks
- 4.9 Using the MacTest SE and SE/30 Menus
- 4.14 Running the Tests
- 4.16 Introduction to AppleCAT SE and AppleCAT SE/30
- 4.17 Running AppleCAT SE and AppleCAT SE/30
- 4.17 Materials Required
- 4.17 Setting Up Test Station and UUT
- 4.20 Establishing Communication
- 4.22 Using the AppleCAT Menus
- 4.26 Running the Tests
- 4.28 Repair Confirmation Codes
- 4.29 SCSI Loopback Jumper Procedure
- 4.29 To Determine If a Jumper Is Needed
- 4.30 To Install the Jumper

### **Section 5 – Troubleshooting**

- 5.3 Introduction
- 5.3 General Information
- 5.3 How to Use the Symptom Chart
- 5.3 Things to Remember
- 5.4 Symptom Chart
- 5.4 Video Problems
- 5.6 Peripheral Problems
- 5.7 Drive Problems
- 5.8 SCSI Problems
- 5.9 Miscellaneous Problems
- 5.10 Isolating a Faulty Macintosh SE SIMM
- 5.12 Battery Verification
- 5.12 Introduction
- 5.12 Materials Required
- 5.12 Verification Procedure

**Section 6 –  
Additional  
Procedures**

- 6.3 Battery Replacement
- 6.3 Introduction
- 6.4 Battery Identification
- 6.5 Replacing Soldered Batteries (SE only)
- 6.7 Replacing Batteries in Battery Holders
- 6.8 SIMM Identification
- 6.8 Speed
- 6.8 1 MB SIMMs
- 6.9 256K SIMMs
- 6.10 Macintosh SE SIMM Upgrades
- 6.10 RAM Configurations
- 6.11 SIMM Arrangements
- 6.12 Logic Board Identification
- 6.14 Solder-Type Logic Board
- 6.15 Solder-Type Upgrades
- 6.17 Jumper-Type Logic Board
- 6.18 Jumper-Type Upgrades
- 6.20 Macintosh SE/30 SIMM Upgrades
- 6.20 RAM Configurations
- 6.20 SIMM Arrangements
- 6.21 SIMM Upgrades
- 6.24 Macintosh SE Chassis Tab Modification
- 6.24 Introduction
- 6.24 Modification Procedure
- 6.25 Chassis Assembly
- 6.25 Introduction
- 6.25 Assembly Procedure
- 6.26 Macintosh SE/30 Logic Board Upgrade
- 6.26 Introduction
- 6.26 Installation
- 6.29 FDHD Upgrade for the Macintosh SE
- 6.29 Introduction
- 6.29 Materials Required
- 6.29 Upgrade Procedure



## Section 7 – SE-Bus PC Card

This section has moved to *Apple PC 5.25 Drive*.

### Illustrated Parts List

IPL.3	Internal View (Figure 1)
IPL.5	Chassis Assembly (Figure 2)
IPL.7	External Rear Housing (Figure 3)
IPL.9	Front Bezel (Figure 4)
IPL.11	Logic Board – Macintosh SE (Figure 5)
IPL.13	Logic Board – Macintosh SE/30 (Figure 6)
IPL.15	Analog Board (Figure 7)
IPL.17	Shipping Fixture, 800K/1.4 MB Drives (Figure 8)
IPL.17	Dual Internal 800K Drives (Figure 9)
IPL.19	Internal HDA (Figure 10)

**Note:** The labels FDHD and FDHD/SuperDrive refer to the same product.

©Apple Computer, Inc., 1987-1991. No portion of this document may be reproduced in any form without the written permission of Apple Computer, Inc.

MacTest, FDHD, Apple Desktop Bus, and SuperDrive are trademarks of Apple Computer, Inc.

Macintosh, AppleCAT, AppleTalk, Apple, and the Apple logo are registered trademarks of Apple Computer, Inc.

MS-DOS is a registered trademark of Microsoft Corporation.

NuBus™ is a trademark of Texas Instruments.

# Macintosh SE and Macintosh SE/30

## Section 1 – Basics

---

### □ CONTENTS

- 1.2 Product Description
- 1.2 Macintosh SE Features
- 1.3 Macintosh SE/30 Features
- 1.6 FDHD Disk Drive
- 1.7 Connector Identification
- 1.10 Internal Expansion Connectors
- 1.11 Theory of Operation
  - 1.11 Introduction
  - 1.11 Main Logic Board
  - 1.14 Power Supply
  - 1.14 Analog Board
  - 1.14 CRT and Video Board
  - 1.15 Disk Drive(s)
  - 1.15 SCSI Hard Disk
  - 1.15 Apple Desktop Bus Keyboard and Mouse
  - 1.16 Care and Handling

---

## □ PRODUCT DESCRIPTION

### **Macintosh SE Features**

The Macintosh® SE is an enhanced Macintosh Plus that supports internal and external customized expansion options. This Macintosh comes with 1 or 2 megabytes of RAM installed, with upgrades to 2.5 and 4 megabytes available. The system also contains an internal connector for expansion of the CPU bus, and provides the customer with a choice of two drive configurations:

- Two internal floppy disk drives
- One internal floppy disk drive and one internal, 20 MB or 40 MB SCSI hard disk drive

The high-density (1.4 MB) Apple Floppy Drive High Density (FDHD) disk drive is now the standard internal drive for all Macintosh SEs. Macintosh SEs sold before August 1989 were furnished with 800K internal disk drives.

The Macintosh SE supports the same peripherals as the Macintosh Plus, and will accept any keyboard or mouse that connects to the new Apple Desktop Bus™.

### ***Macintosh SE Internal Features***

The Macintosh SE includes these new or improved (as compared to the Macintosh Plus) internal features:

- 1 MB or 2 MB of RAM on repositioned, slanted Single In-line Memory Modules (SIMMs)
- New 256K ROM with modifications that support the Apple Desktop Bus and FDHD disk drive, and improve support of the Small Computer System Interface (SCSI) and AppleTalk
- Choice of internal 20 MB or 40 MB SCSI hard disk or second internal floppy disk drive
- Higher capacity 80-watt, wide-input-range power supply
- Fan for cooling
- Improved hardware handshaking on the SCSI port

- 96-pin Euro-DIN bus connector for internal expansion board or other I/O device (mounting holes provided)
- Swing-away logic board mounting to allow easy removal when an internal expansion board is installed
- One or two 1.4 MB, 3.5-inch FDHD disk drives
- SWIM disk controller chip, which replaces the IWM chip for controlling disk drives
- Long-life lithium battery for clock and RAM cache

#### *Macintosh SE External Features*

The Macintosh SE includes these external features:

- Two Apple Desktop Bus connectors that support the detached keyboard and mouse
- Snap-out door at the rear to support optional external I/O device

#### **Macintosh SE/30 Features**

The Macintosh SE/30, which is named for its 16-MHz 68030 microprocessor, is the next generation in the compact Macintosh SE line. The system is designed to provide increased performance (up to four times faster than the Macintosh SE), greater memory expandability (up to 8 megabytes), and larger hard disk capacity.

#### *Macintosh SE/30 System Configurations*

The Macintosh SE/30 requires System 6.0.3 (or later) software. The system comes with 1 or 4 megabytes of RAM installed, and contains a 120-pin, vertically mounted expansion connector. The system also includes an internal FDHD disk drive. The customer can choose from three standard configurations:

- 1 MB of RAM and the FDHD drive
- 1 MB of RAM, FDHD drive, and 40 MB SCSI hard disk
- 4 MB of RAM, FDHD drive, and 80 MB SCSI hard disk

## *Macintosh SE/30 System Features*

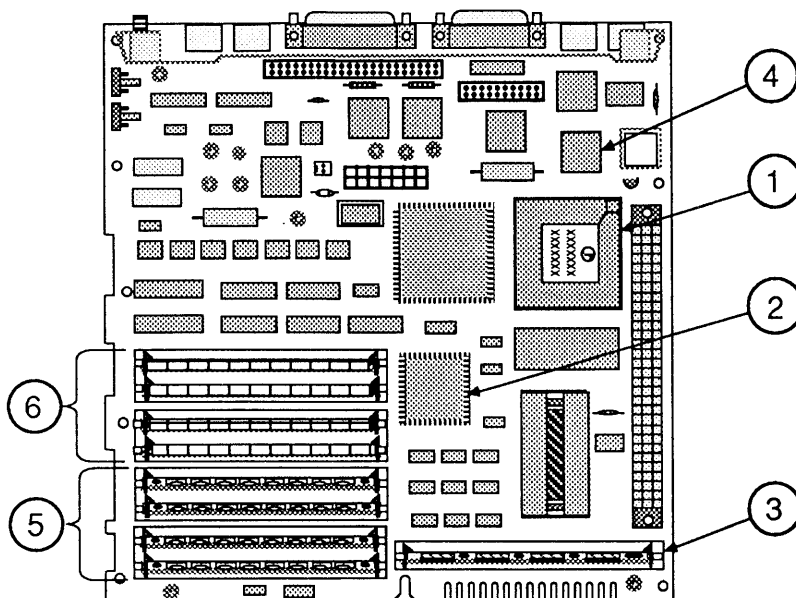
The Macintosh SE/30 includes the following system features:

- 68030 microprocessor running at 16 MHz
- 68882 floating-point (numerics) coprocessor
- 1 MB or 4 MB of RAM on vertically mounted Single In-line Memory Modules (SIMMs)
- Eight repositioned SIMM sockets that can accommodate system expansion to 8 MB
- Single 32-bit, 120-pin expansion slot ("030 Direct Slot")
- Four 256K ROMs on a SIMM, upgraded to support the FDHD disk drive
- SWIM disk controller chip, which replaces the IWM chip for controlling disk drives
- Single 1.4 MB, 3.5-inch FDHD disk drive
- Choice of internal 40 MB or 80 MB SCSI hard disk drive
- Removable, seven-year lithium battery

## *Macintosh SE/30 Logic Board*

At the heart of the Macintosh SE/30 is the *Motorola 68030 microprocessor* (Figure 1, #1). The 68030 is a true 32-bit microprocessor that is fully compatible with earlier 16- and 24-bit Macintosh microprocessors. This high-performance microprocessor runs at 16 MHz and is designed to handle paged memory management (incorporates the PMMU chip available for the Macintosh II logic board). A *68882 numerics coprocessor* (Figure 1, #2) enhances system performance by assisting with the floating-point calculations common in spreadsheet applications.





**FIGURE 1**

The Macintosh SE/30 logic board includes new *ROM chips* soldered on a SIMM board (Figure 1, #3). These ROM chips include code that supports the FDHD disk drive and SWIM disk controller chip. The *SWIM chip* (Figure 1, #4) enables the FDHD to read and write both GCR (Group-Coded Recording) data formats and MFM (Modified Frequency Modification) data formats.

RAM memory in the Macintosh SE/30 is packaged in 256K or 1 MB *Single In-line Memory Modules (SIMMs)*. The Macintosh SE/30 logic board has two banks of sockets that will hold up to eight SIMMs. Bank A (Figure 1, #5) and Bank B (Figure 1, #6) each contain four slots. Each bank, if used, must be filled with identical 256K or 1 MB SIMMs. The following chart illustrates RAM configurations that the Macintosh SE/30 will support:

<u>RAM</u>	<u>Bank A</u>	<u>Bank B</u>
1 MB	Four 256K SIMMs	Empty
2 MB	Four 256K SIMMs	Four 256K SIMMs
4 MB	Four 1 MB SIMMs	Empty
5 MB	Four 1 MB SIMMs	Four 256K SIMMs
8 MB	Four 1 MB SIMMs	Four 1 MB SIMMs

## **FDHD Disk Drive**

The 3.5-inch, 1.4 MB FDHD disk drive is a high-density data storage system for both the Macintosh SE and the Macintosh SE/30. Special high-density, 3.5-inch media are required to take full advantage of the increased data storage capacity of the FDHD drive. Do not, however, use the high-density media in a 400K or 800K disk drive; such data will be unreliable. A simple rule-of-thumb is always to use media that are appropriate for the drive of lowest capacity; if you have both 800K and 1.4 MB disk drives, to be safe use only 800K media.

When used with the Apple File Exchange utility, the FDHD disk drive also enables Apple systems (GCR data format) to exchange data with MS-DOS systems (MFM data format). The FDHD disk drive can read/write and format 400K, 800K, and 1.4 MB Macintosh disks; 720K and 1.4 MB MS-DOS disks; and 800K ProDOS disks. When reading data in other formats, the Macintosh SE/30 first copies MS-DOS or ProDOS data files using the FDHD drive and Apple File Exchange utility, and then uses special file translators to convert the data from one application format to another. Some applications, such as Microsoft *Word*, perform their own translations.

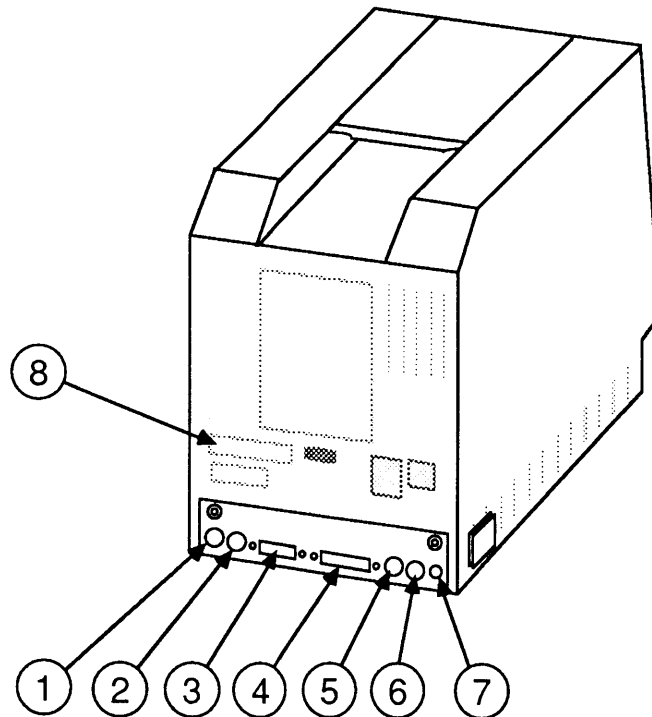
## Connector Identification

The external connectors on the Macintosh SE and Macintosh SE/30 are the same, but the internal connectors differ slightly between models. The following section shows the location of all external and internal connectors on the Macintosh SE and Macintosh SE/30.

### *Back Panel Connectors*

The back panel of the Macintosh SE and Macintosh SE/30 has seven installed ports, and a slot for the installation of an additional expansion port. The number beside the port name below corresponds to the numbered arrow in Figure 2.

- #1 Apple Desktop Bus (mini DIN-4)
- #2 Apple Desktop Bus (mini DIN-4)
- #3 External drive port (DB-19)
- #4 SCSI port (DB-25)
- #5 Printer port (mini DIN-8)
- #6 Modem port (mini DIN-8)
- #7 Sound port (RCA phono jack)
- #8 Slot for optional expansion port

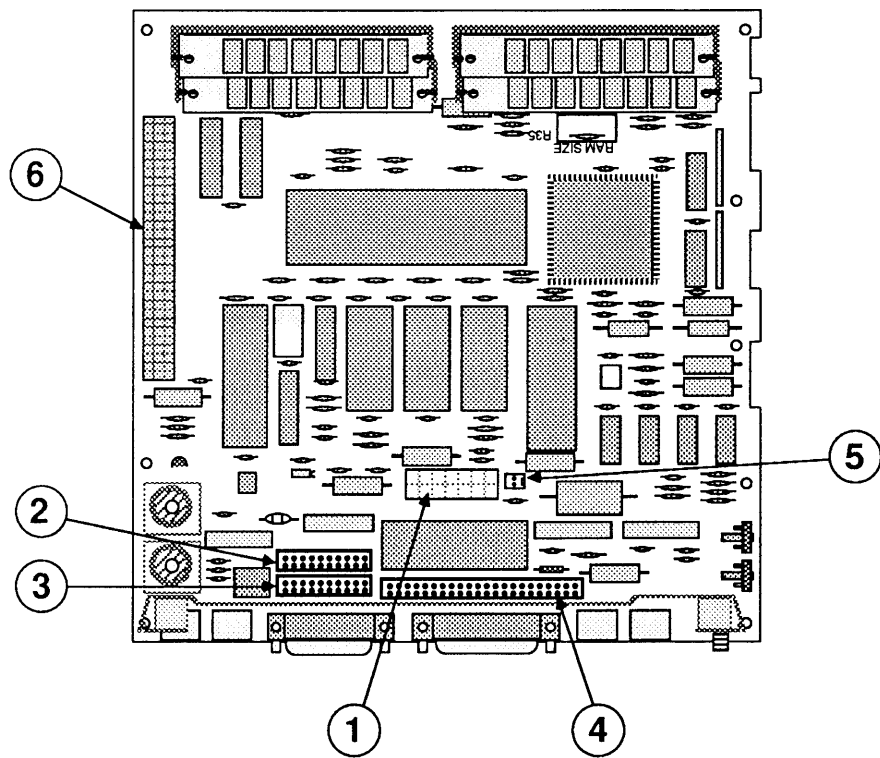


**FIGURE 2**

*Macintosh SE  
Main Logic Board  
Connectors*

There are six connectors on the Macintosh SE logic board. In the list below, the number beside the connector name corresponds to the numbered arrow in Figure 3.

- #1 Power connector
- #2 Connector for lower internal drive
- #3 Connector for upper internal drive
- #4 Internal hard disk SCSI 50-pin ribbon cable connector
- #5 Speaker connector
- #6 96-pin Euro-DIN expansion connector

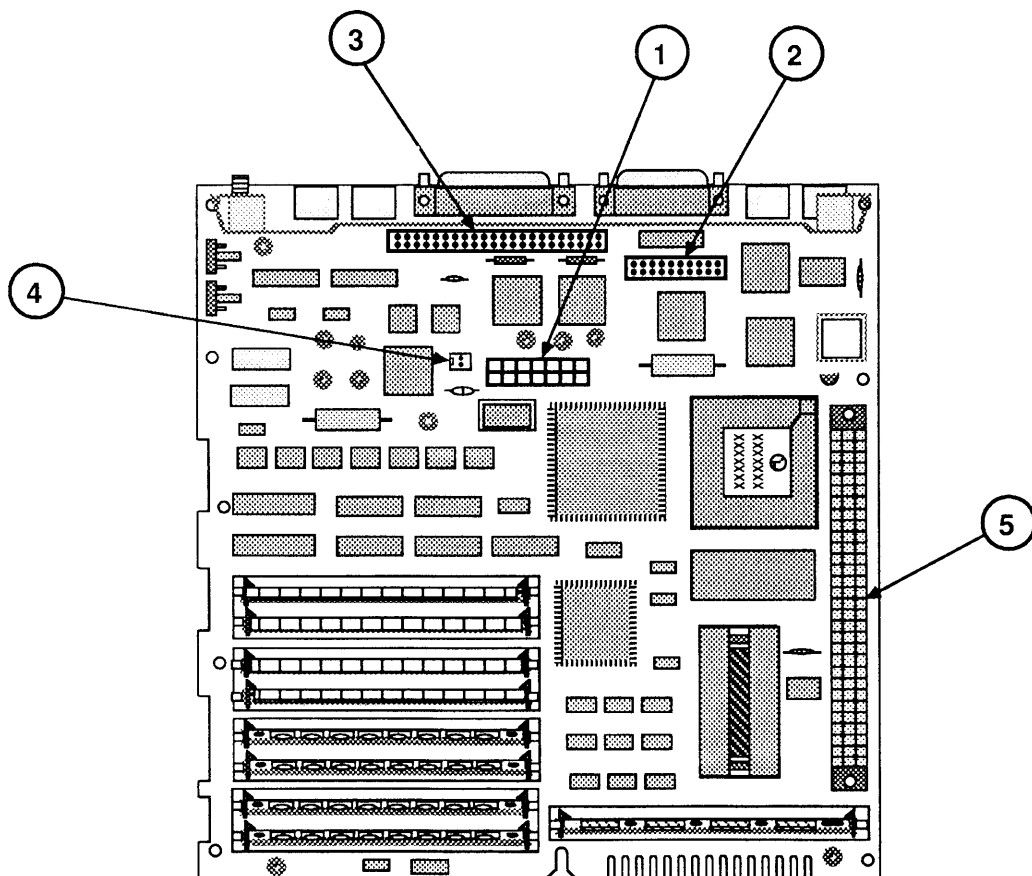


**FIGURE 3**

*Macintosh SE/30  
Main Logic Board  
Connectors*

There are five connectors on the Macintosh SE/30 logic board. In the list below, the number beside the connector name corresponds to the numbered arrow in Figure 4.

- #1 Power connector
- #2 Connector for internal 1.4 MB, 3.5-inch FDHD disk drive
- #3 Internal hard disk SCSI 50-pin ribbon cable connector
- #4 Speaker connector
- #5 120-pin, 32-bit, "030 Direct Slot" expansion connector



**FIGURE 4**



## Internal Expansion Connectors

The Macintosh SE contains a 96-pin, right-angle connector for supporting Apple and third-party expansion cards. This connector has been replaced in the Macintosh SE/30 by a 120-pin connector that is vertically mounted to simplify installation.

### *Macintosh SE 96-pin Expansion Connector*

The 96-pin Euro-DIN connector on the Macintosh SE logic board may be used in either of two ways:

- To attach a third-party coprocessor board directly to the logic board via a right-angle connector. The coprocessor board (measuring about 4 X 8 inches) would lie above and parallel to the logic board, supported by standoffs that may be installed in the logic board holes provided for that purpose.
- To attach a cable that is then routed to an external I/O device. From the connector on the logic board, the cable is routed up through the forward hole in the bottom of the metal chassis, through the mounting bracket on the rear of the chassis, and out through the snap-out accessory door on the rear of the case. (Remove the rear accessory door from inside the case.)

**Note:** Protruding tabs on some Macintosh SE chassis may interfere with the installation of third-party coprocessor boards, cards, or cables. If you encounter such an installation problem, perform the "Chassis Tab Modification" procedure (see Additional Procedures).

### *Macintosh SE/30 "030 Direct Slot" Expansion Connector*

The internal expansion connector in the Macintosh SE/30, known as the "030 Direct Slot," enables Apple and third-party expansion cards to directly access the 32-bit address and data bus of the 68030 microprocessor. This new slot architecture delivers the improved performance of the 32-bit bus and has other benefits for expansion card developers. However, the greater pin demands of the 32-bit bus require using a 120-pin connector in the Macintosh SE/30. As a result, most accelerator and video expansion cards designed to utilize the 16-bit data bus in the Macintosh SE cannot be used in the Macintosh SE/30.

---

## □ THEORY OF OPERATION

### Introduction

The Macintosh SE and Macintosh SE/30 have eight basic functional units:

- Main logic board
- Power supply
- Analog board
- Internal disk drive(s)
- Internal SCSI hard disk (optional for Macintosh SE)
- Video board
- Video display (CRT)
- Apple Desktop Bus keyboard and mouse

"Module swapping," or repair by replacement of faulty modules, is much faster if you have a basic understanding of the function of each module in the unit. If you know what each module does when it is functioning normally, you can more easily decide which module is at fault when a particular function is missing or degraded. This is called "logical troubleshooting." The following section describes the Macintosh SE and Macintosh SE/30 modules and the functions they perform.

### Main Logic Board

The main logic boards of the Macintosh SE and Macintosh SE/30 contain the components described below. Components unique to one system or the other are identified as such.

### CPU

Macintosh SE: The Central Processing Unit (CPU) in the Macintosh SE is a Motorola 68000 microprocessor. The microprocessor gets instructions from memory, translates them, and carries them out. It communicates with all components on the logic board, and with all peripherals.

Macintosh SE/30: At the heart of the Macintosh SE/30 is the Motorola 68030 microprocessor with a 32-bit external address and data bus. This high-performance microprocessor operates at 16 MHz—double the clock speed of the 68000. The 68030 microprocessor also supports paged memory management, thereby eliminating the need for a separate PMMU chip. Paged memory management is a type of parallel processing that enables the computer to swap *pages* of data from a disk into RAM memory, as needed, which makes the Macintosh SE/30 appear to have more memory than it actually has.

The Macintosh SE/30 logic board also includes the 68882 math coprocessor composed of IEEE P754 standard floating-point ICs. The 68882 provides a high degree of precision and speed for Macintosh programs.

## RAM

Macintosh SE: Macintosh SE RAM (Random-Access Memory) is installed on 150-nanosecond Single In-line Memory Modules (SIMMs). Each SIMM is a small printed circuit card with mounted ICs. The logic board has four sockets for SIMMs. The Macintosh SE comes with four 256K SIMMs installed for 1 MB of RAM, or with two 1-MB SIMMs installed for 2 MB of RAM.

Macintosh SE/30: The Macintosh SE/30 has two banks of four SIMM sockets, and comes with 1 MB or 4 MB of RAM. The amount of RAM on the logic board can be changed by installing SIMMs of higher memory capacity. Each bank must be filled with four SIMMs of the same size, and Bank A (the first four rows closest to the edge of the board) must be filled first, or filled with the SIMMs of higher capacity. Both 256K and 1 MB SIMMs are currently available, allowing 1 MB, 2 MB, 4 MB, 5 MB, or 8 MB configurations. The Macintosh SE/30 can use only 120-nanosecond SIMMs.

Every time the Macintosh SE or Macintosh SE/30 is powered on, the system performs a memory test to determine how much RAM is present in the machine.

## ROM

Macintosh SE: The two ROM (Read-Only Memory) chips in the Macintosh SE contain the operating code for the 68000. The Macintosh SE ROM supports the Apple Desktop Bus, SCSI devices, AppleTalk networks, and (since August, 1989) the FDHD disk drive. The ROM chips at positions D6 and D7 on the logic board are socketed. These ROMs should be replaced only when installing the FDHD Upgrade Kit.

Macintosh SE/30: The four custom chips making up system ROM for the Macintosh SE/30 are mounted on a single SIMM module. This design facilitates feature set upgrades, and allows the technician to easily install upgraded or customized ROM. Included in the 256K of permanent ROM memory for the Macintosh SE/30 are routines for supporting the FDHD disk drive and SWIM disk controller, NuBus slot manager, and Apple sound manager.

*Disk  
Controller  
Chip*

Macintosh SE: Macintosh SEs sold *after* August 1989, or Macintosh SEs upgraded to run the 1.4 MB FDHD disk drive, use the SWIM disk controller chip (see the description under "Macintosh SE/30" below). Macintosh SEs sold *before* August 1989 use the IWM chip, a self-contained disk controller on one IC that supports all Apple format (GCR, for Group Code Recording), 3.5-inch internal and external disk drives. The IWM simplifies the microprocessor's task of reading from and writing to the disk drives. The IWM, located at position D8 on the logic board, is socketed and may be replaced by the technician.

Macintosh SE/30: The Macintosh SE/30 and all current versions of the Macintosh SE use a SWIM disk controller chip. The SWIM chip incorporates the functionality of the IWM, and also enables the FDHD disk drive to exchange data between Apple and MS-DOS systems. The SWIM chip interprets, converts, and outputs dual disk (clock/time) and file (data) signals as appropriate for either GCR (variable rotational speed) or MFM (constant rotational speed) formats. The SWIM chip enables the FDHD drive to read, write, and format in both GCR (Apple 400K and 800K) and MFM (MS-DOS 720K and 1.4 MB; and Apple 1.4 MB) data formats.

*Serial  
Communications  
Controller*

The Serial Communications Controller (SCC) handles information sent to and received from the serial ports on the back of the machine.

*Versatile  
Interface  
Adaptor*

The Versatile Interface Adaptor (VIA) converts serial data (from input devices) to parallel data, so that the logic board can interpret the information correctly.

*Gate Array*

The Macintosh SE and Macintosh SE/30 incorporate the gate array implementation of PAL (Programmable Array Logic) and other discrete logic devices. The gate array handles control and synchronizing functions for the main logic board.

*Oscillator*

The oscillator, or timing device, generates the master clock pulse, which is broken down into the various timing signals needed by the ICs on the logic board.

### **Battery**

The Macintosh SE and Macintosh SE/30 are equipped with a single long-life lithium battery that provides power to the system clock and calendar. This battery is installed in a battery holder and can be replaced without cutting and soldering. In earlier versions of the Macintosh SE, the battery is soldered to the logic board.

### **Sound Chip**

The sound chip supports the internal speaker connector and the external sound jack. The Macintosh SE/30 logic board contains a new, full-stereo sound chip.

### **SCSI Bus**

The Apple SCSI manager supports up to seven daisy-chained SCSI devices.

### **Apple Desktop Bus**

The Apple Desktop Bus is a method and protocol for connecting computers with human input devices. The Macintosh SE and Macintosh SE/30 control the flow of data to connected devices by issuing commands through the Apple Desktop Bus.

### **Power Supply**

The power supply is attached to the bottom half of the analog board. This is where AC voltage is converted to DC voltage for use by the entire system. The power supply operates on standard line voltage and outputs various DC voltages, which are used by the logic board, the video display, and by some peripheral devices.

### **Analog Board**

The analog board contains circuits for both horizontal and vertical signals that are fed to the CRT. The flyback transformer on the analog board delivers high voltage directly to the CRT through the anode connector.

### **CRT and Video Board**

The Cathode-Ray Tube (CRT) provides the high-resolution video display. The anode of the CRT receives high voltage from the flyback transformer on the analog board. The analog board also supplies the voltages and signals to the neck and yoke of the CRT that enable the CRT to create the video display. There is a separate video board on the neck of the CRT that provides video amplification and overvoltage protection.



## **Disk Drive(s)**

The internal disk drive (or drives) used in the Macintosh SE and Macintosh SE/30 connect to the main logic board through two internally installed connectors. An external disk drive may be connected to the disk drive port on the back of the logic board. The flow of data between the logic board and the disk drives is channeled through a disk controller chip, which controls reading and writing operations.

The internal disk drive in the Macintosh SE and Macintosh SE/30 is the high-density, 1.4 MB FDHD (Floppy Drive High Density) disk drive. The FDHD drive reads/writes and formats both GCR and MFM format disks, thereby providing data exchangeability between MS-DOS, ProDOS, and Macintosh systems. An application-specific translator within the Apple File Exchange utility program must be used to translate the exchanged data for use within an application program.

## **SCSI Hard Disk**

The SCSI hard disk (optional on the Macintosh SE) connects to the logic board through the internal SCSI connector. Other SCSI devices may be daisy-chained to the Macintosh SE and Macintosh SE/30 through the external SCSI port. The SCSI bus on the logic board will support a total of seven SCSI devices.

## **Apple Desktop Bus Keyboard and Mouse**

The keyboard connects to the Apple Desktop Bus (ADB) port on the Macintosh SE and Macintosh SE/30. The mouse connects to the keyboard or to the computer's other ADB port. All devices made for the Apple Desktop Bus have a microprocessor that makes them intelligent devices. All Apple Desktop Bus devices communicate with the logic board via a mini DIN-4 connector. All except the mouse have ports for daisy-chaining other ADB devices. The mouse must be the last device in the chain because it has no port.

---

## □ CARE AND HANDLING

The Macintosh SE and Macintosh SE/30 are small enough to be somewhat portable. However, the computers contain a CRT (cathode-ray tube—the picture tube), which operates at very high voltages and contains a high vacuum. If cracked or broken, the CRT can implode (collapse into itself), then explode.

---

***WARNING: Before working inside this computer, read Section 8, CRT Safety, under the You Oughta Know tab.***

---

Both computers may also contain hard disks (a hard disk drive comes standard with the Macintosh SE/30, and is optional for the Macintosh SE). The hard disk is a mechanical device with moving parts. Rough handling such as jarring or bumping, especially while the hard disk is running, could result in a mechanical failure or damage to the information stored on the hard disk.

**Careless handling accounts for more drive failures than all other factors combined.**

With these facts in mind, always be sure to:

- Leave the Macintosh SE and Macintosh SE/30, and the CRT and hard disk drive modules, in shipping containers until use.
- Use the shipping containers and packing materials when transporting the computer or modules.
- Place the computer on a protective padded surface before beginning any repair procedure.
- Never move a computer with a hard disk drive during power-down. After the power is turned off, the hard disk will slow down and the heads will land within 15 seconds. Any jolts to the drive during power-down may cause the heads to crash into the media surfaces.
- Never drop a Macintosh SE or Macintosh SE/30. Even a drop of one inch to a hard surface could cause implosion of the CRT and/or a hard disk drive failure.

# Macintosh SE and Macintosh SE/30

## Section 2 – Take-Apart

---

### □ CONTENTS

2.2	Cover
2.5	Discharging the Cathode-Ray Tube (CRT)
2.5	Discharge Procedure
2.7	Anode Cap
2.8	Analog Board and Power Supply
2.14	Main Logic Board
2.16	Identifying Macintosh SE Logic Boards
2.22	SIMMs
2.25	Video Board
2.28	Cathode-Ray Tube (CRT)
2.31	Internal SCSI Hard Disk Drive
2.31	Identifying 20SC Revision A and B Drives
2.33	Removing the Drive From Its Carrier
2.33	Replacing the Drive In Its Carrier
2.35	LED Cable Assembly
2.37	Upper Internal Disk Drive
2.40	Lower Internal Disk Drive
2.42	Fan Assembly
2.46	Speaker, Front Bezel, and Slot Cover

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

---

## □ COVER

---

**WARNING:** *Macintosh SE and SE/30 computers contain high voltage and a high-vacuum picture tube. To prevent serious personal injury and property damage, be sure you read and understand the safety precautions in Section 8, CRT Safety, under the You Oughta Know tab before you remove the back cover. Failure to follow the safety rules could result in serious injury.*

---

---

**CAUTION:** *Electrostatic Discharge (ESD) can cause severe damage to sensitive microcircuits. The Macintosh SE and Macintosh SE/30 logic boards contain C-MOS components, among the most sensitive chips in use today. Printed circuit assemblies and ICs (integrated circuits, or "chips"), especially those that are removable, must also be handled with extreme care. The Macintosh SE and Macintosh SE/30 also have removable ROMs, ROM SIMMs, and RAM SIMMs, which contain the RAM memory. The C-MOS chips, ROMs, and SIMMs are very susceptible to ESD damage. To prevent ESD damage to these components, follow the precautions outlined for ESD prevention in You Oughta Know.*

---

### Materials Required

Foam pad  
Small flat-blade screwdriver  
15-inch Torx screwdriver  
Pull-apart tool

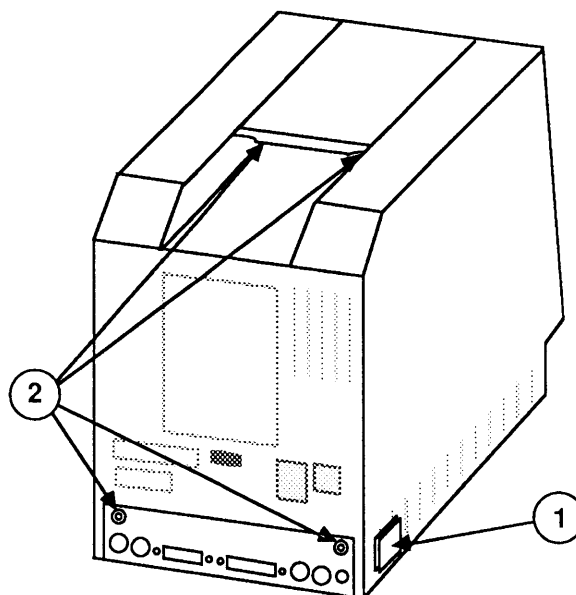
### Remove

Remove the cover as follows:

1. Place the Macintosh SE or Macintosh SE/30 on the foam pad in an area where you will have ample room to remove the cover. Don't put it under shelves containing objects that could fall on the CRT and break it.

**Note:** Be especially careful when handling a Macintosh SE/30, or a Macintosh SE with an internal hard disk. Read "Care and Handling" in the Basics section before continuing.

2. Turn off the power and disconnect the power cord.
3. Disconnect the keyboard and mouse cables and all other peripheral cables from the back of the Macintosh SE or Macintosh SE/30.



**FIGURE 1**

4. If a reset/interrupt switch (Figure 1, #1) is present, pry it off with a small flat-blade screwdriver.
5. Place the Macintosh SE or Macintosh SE/30 face-down on the pad.
6. Use the Torx screwdriver to remove the four case screws (Figure 1, #2).
7. Carefully lift up the cover and set it out of the way. If the cover is difficult to remove, use the pull-apart tool. (To prevent cosmetic damage to the cover and bezel, do not use a screwdriver to pry off the cover.)
8. Remove the insulating paper shroud from the bottom of the Macintosh SE or Macintosh SE/30.

## Replace

Replace the cover as follows:

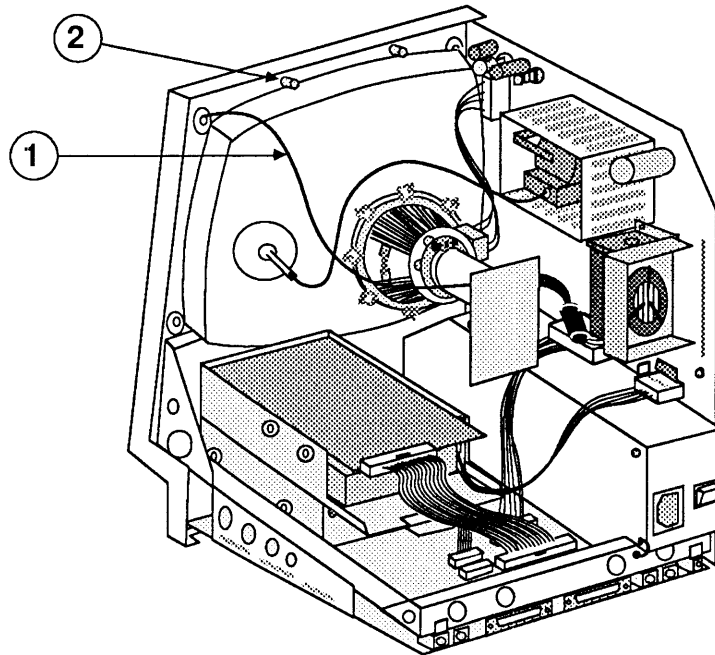
---

***WARNING:*** *The edges of the metal chassis may be sharp. When moving the computer with the cover removed, be sure to handle the metal chassis carefully.*

---

1. Place the computer face-down on the foam pad.
2. Replace the insulating paper shroud over the bottom of the Macintosh SE or Macintosh SE/30.





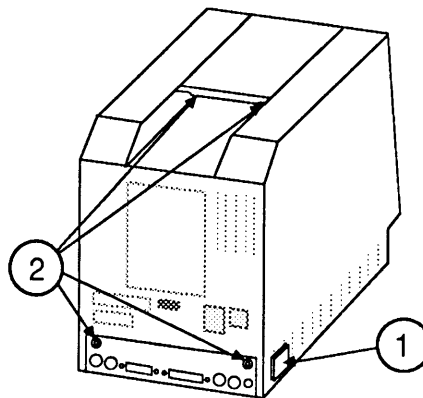
**FIGURE 2**

3. Slide the cover over the chassis and fit it into the front bezel, making sure the video ground cable (Figure 2, #1) is out of the way of the case screw holder (Figure 2, #2).

4. Reinstall the four case screws (Figure 3, #2).

**Note:** The two black screws should be installed in the bottom of the case and the two silver screws in the top.

5. Reinstall the reset/interrupt switch (Figure 3, #1).



**FIGURE 3**

---

## ❑ DISCHARGING THE CATHODE-RAY TUBE (CRT)

The CRT in the Macintosh SE and Macintosh SE/30 is equipped with a bleeder resistor that automatically drains the charge from the CRT when the power is shut off. **Nevertheless, you must follow the discharge procedure below to protect yourself in the event that the resistor has failed and the anode is still charged.**

### Materials Required

Safety goggles  
Foam pad (ungrounded)  
Needlenose pliers  
Alligator lead  
New CRT discharge tool (part number 076-0381)

---

**WARNING:** Before starting, read the safety precautions and the CRT discharge procedure in Section 8, CRT Safety, under the You Oughta Know tab. Alternative instructions for discharging the CRT using the older version of the discharge tool (and/or a screwdriver) are also given in that section.

---

### Discharge Procedure

1. Remove your grounding wriststrap and jewelry and put on safety goggles before beginning!

---

**WARNING:** Do not touch the yoke wires (Figure 4, #1), the anode wire (Figure 4, #2), the anode connector (Figure 4, #3), or the flyback transformer (Figure 4, #4).

---

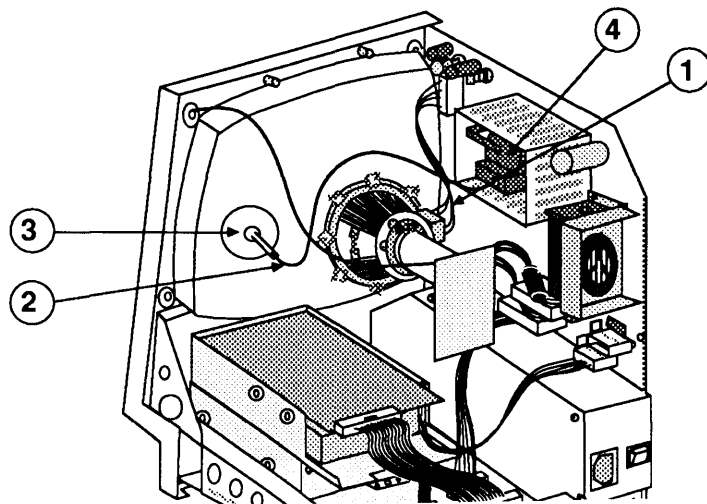
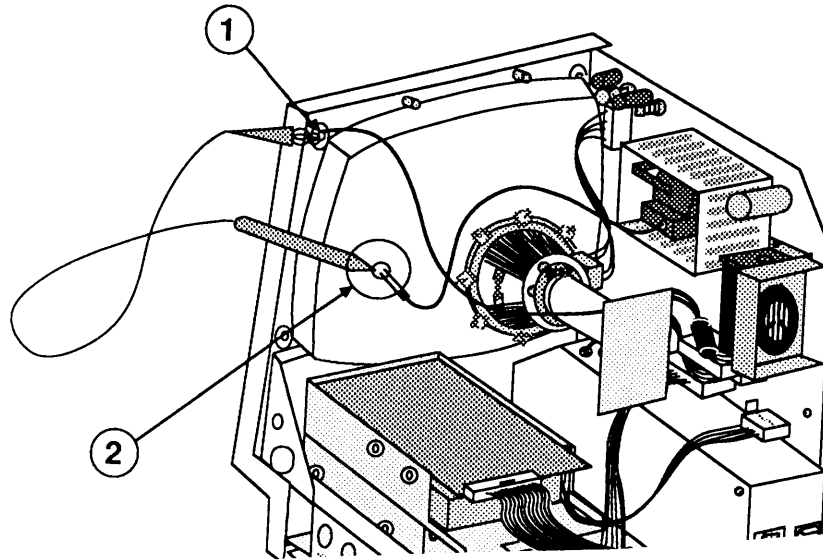


FIGURE 4

2. Remove the cover.
3. Set the monitor upright on the ungrounded foam pad, with the back of the monitor facing you.



**FIGURE 5**

4. Attach the alligator clip on the CRT discharge tool to the metal part of the **ground lug** (Figure 5, #1).

---

**CAUTION:** Discharge the anode to the metal part of the ground lug displayed in Figure 5, #1. **Failure to do so will damage the main logic board and/or the analog board.**

---

5. Put one hand behind your back and grasp the handle of the discharge tool with your other hand.

---

**WARNING:** Use only one hand when discharging the CRT. This is to prevent you from becoming a path for current should your hand slip and touch the metal part of the discharge tool. While discharging the CRT, grasp only the insulated handle of the discharge tool.

---

6. Hold the CRT discharge tool to the tube surface, and insert it under the anode cap (Figure 5, #2) until it touches the anode ring.

7. Remove the CRT discharge tool from under the anode cap. Remove the alligator clip from the ground lug. Set the tool aside where it will be out of the way.

**Note:** If the bleeder resistor fails, a secondary charge can build up over time, even after you have discharged the CRT. If repairs are not finished within 30 minutes, the anode should be discharged again. Or, to ensure that any residual charge is dissipated during the service procedure, establish a path for anode current to ground by fastening one end of an alligator lead to the metal ground lug and connecting the other end to the anode ring.

### **Anode Cap**

For some of the following procedures, you may have to remove the anode cap. To do so, peel back the anode cap until you can see the anode ring at the center. Look at the metal connector in the center of the cap and notice how it is clipped into the CRT. Use the needlenose pliers to compress the two prongs on the clip to free it from the CRT, and lift it off the tube.

---

## ❑ ANALOG BOARD AND POWER SUPPLY

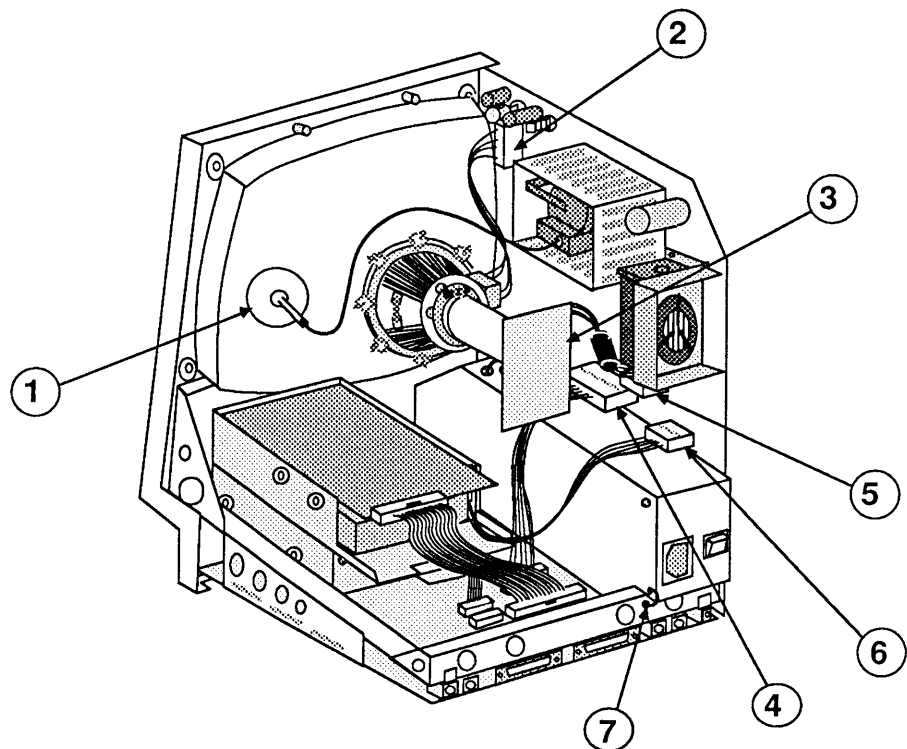
### Materials Required

Grounded workbench pad and wriststrap  
Small Phillips screwdriver

### Remove

To remove the analog board and power supply:

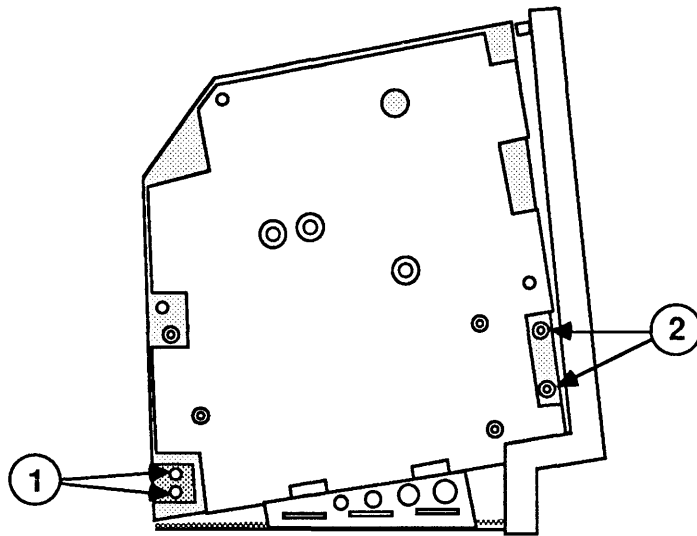
1. Remove the cover and discharge the CRT.
2. Remove the anode cap (Figure 6, #1).



**FIGURE 6**

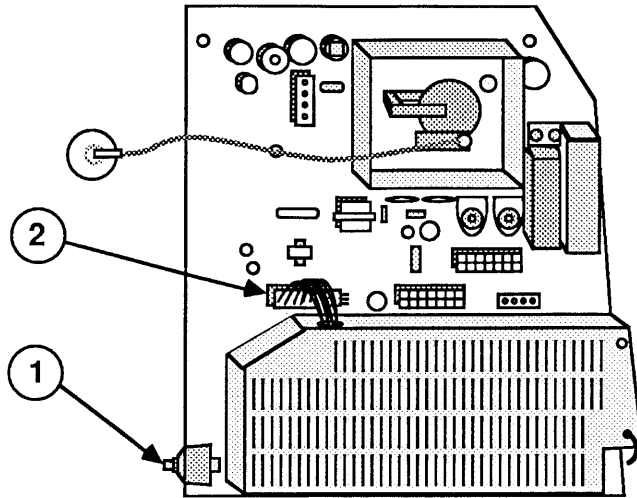
3. Move the Macintosh SE or Macintosh SE/30 onto a soft, grounded workbench pad and put on your grounding wriststrap. (Never do this until after the CRT is discharged.)
4. Carefully pull the video board (Figure 6, #3) off the neck of the CRT.

5. Remove the following cables from the analog board:
  - Yoke cable (Figure 6, #2) (First depress the tab.)
  - Main logic board cable (Figure 6, #4)
  - Video board cable (Figure 6, #5)
  - Hard disk power cable, if present (Figure 6, #6)
6. Remove the screw holding the power supply ground wire to the chassis (Figure 6, #7).



**FIGURE 7**

7. Using the small Phillips screwdriver, remove the two lower left analog board screws and the metal clip (Figure 7, #1).
8. Remove the two lower right analog board screws (Figure 7, #2).
9. Place the Macintosh SE or Macintosh SE/30 face down on the grounded workbench pad.



**FIGURE 8**

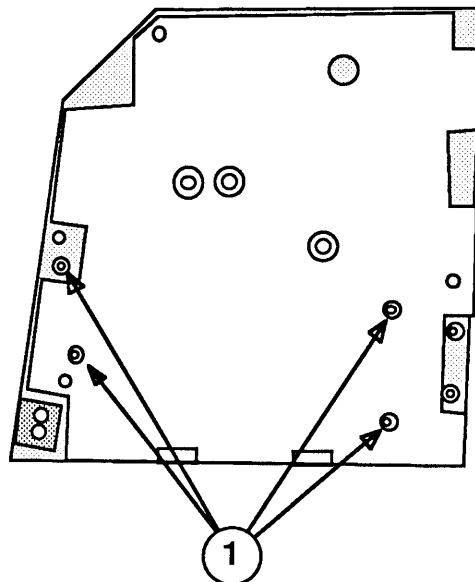
10. Carefully move the analog board (with power supply attached) up and away from the chassis, taking care not to bump the CRT or the brightness control knob (Figure 8, #1) at the lower front of the analog board.

---

***WARNING:*** Do not grasp the analog board by the fan. Hold the analog board by the edges, using your fingertips.

---

11. Disconnect the power supply cable (Figure 8, #2) from the analog board.



**FIGURE 9**

12. Place the board on the grounded workbench pad with the power supply down, and remove the four power supply screws (Figure 9, #1). Lift the board free.

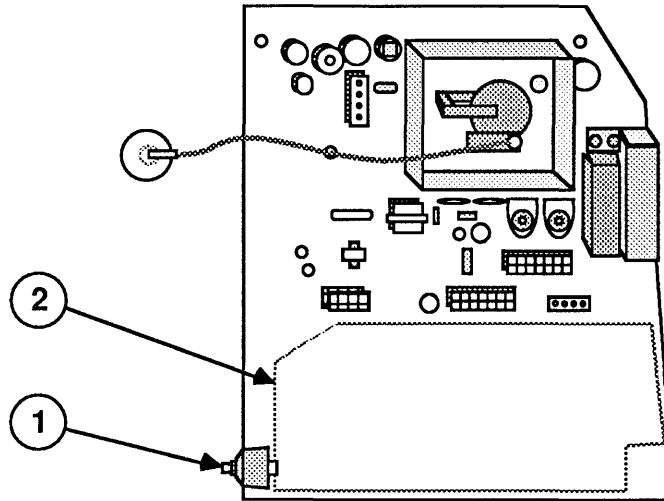


FIGURE 10

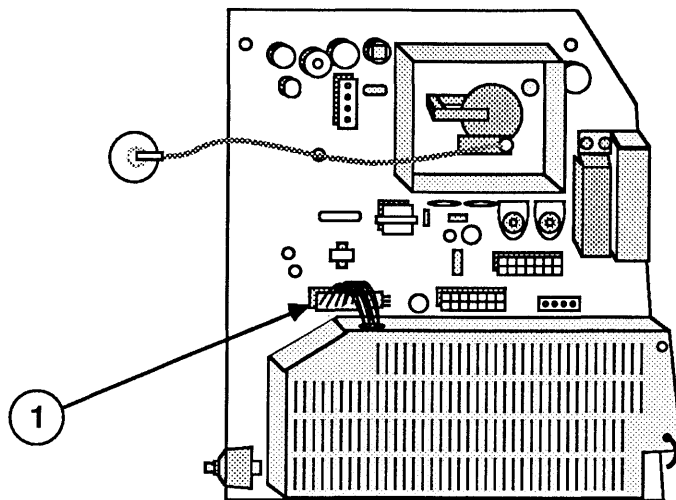
13. If you are returning the analog board to Apple, first remove the brightness knob (Figure 10, #1) and put the knob on the replacement analog board.

## Replace

Follow the steps below to replace the power supply and analog board. Also, **if you are installing a new analog board on a Macintosh SE, and a clip-on ferrite bead is packaged with the new analog board**, you may have to install the ferrite bead on the video board cable. Check your video board; if a ferrite bead is not on the cable, install the clip-on ferrite bead enclosed with the new analog board on the video board cable (see the Video Board procedure).

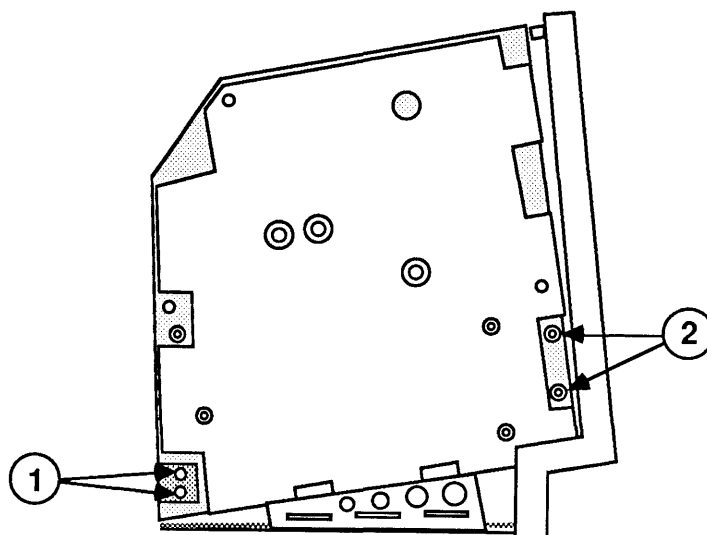
1. Place the power supply on the inside of the analog board, using the painted outline on the board as a guide (Figure 10, #2).
2. Holding the power supply in position, flip the analog board and power supply to a face-down position with the power supply underneath. **Do not grasp the analog board by the fan.**
3. Replace the four power supply screws (Figure 9, #1).



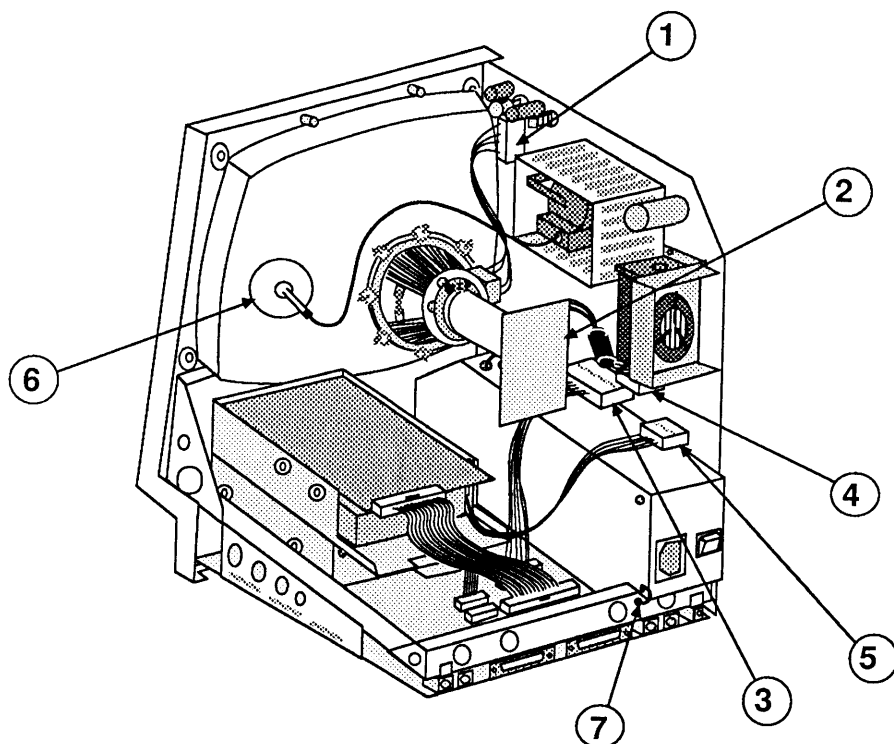


**FIGURE 11**

4. Reconnect the power supply cable (Figure 11, #1).
5. With the Macintosh SE or Macintosh SE/30 face down on the grounded workbench pad, carefully place the analog board/power supply unit in the chassis, taking care not to bump the CRT or the brightness knob at the lower front of the analog board. It is easiest if you slide the corner with the brightness knob in first, then maneuver the power supply cage past the metal bracket at the back of the chassis.  
**Again, do not grasp the analog board by the fan.**
6. Replace the metal clip and the two lower-left analog board screws (Figure 12, #1).



**FIGURE 12**



**FIGURE 13**

7. Replace the two lower-right analog board screws (Figure 12, #2).
8. Reconnect the following cables to the analog board:
  - Yoke cable (Figure 13, #1)
  - Main logic board cable (Figure 13, #3)
  - Video board cable (Figure 13, #4)
  - Hard disk drive power cable (Figure 13, #5), if present
9. Replace the anode cap (Figure 13, #6).
10. Reconnect the video board (Figure 13, #2) to the neck of the CRT. It fits only one way.
11. Replace the screw that secures the power supply ground wire to the chassis (Figure 13, #7).
12. Replace the cover.

## □ MAIN LOGIC BOARD

### Materials Required

Grounded workbench pad and wriststrap  
Small Phillips screwdriver  
IC extractor

### Remove

Follow these steps to remove the main logic board:

1. Remove the cover.
2. Discharge the CRT.
3. Put on your grounding wriststrap. (Never do this until after the CRT has been discharged.)

---

**CAUTION:** In the following step, pull only on the pulltabs or on the connectors themselves, **not** on the cables.

---

4. Carefully pull the video board (Figure 14, #4) off the neck of the CRT.

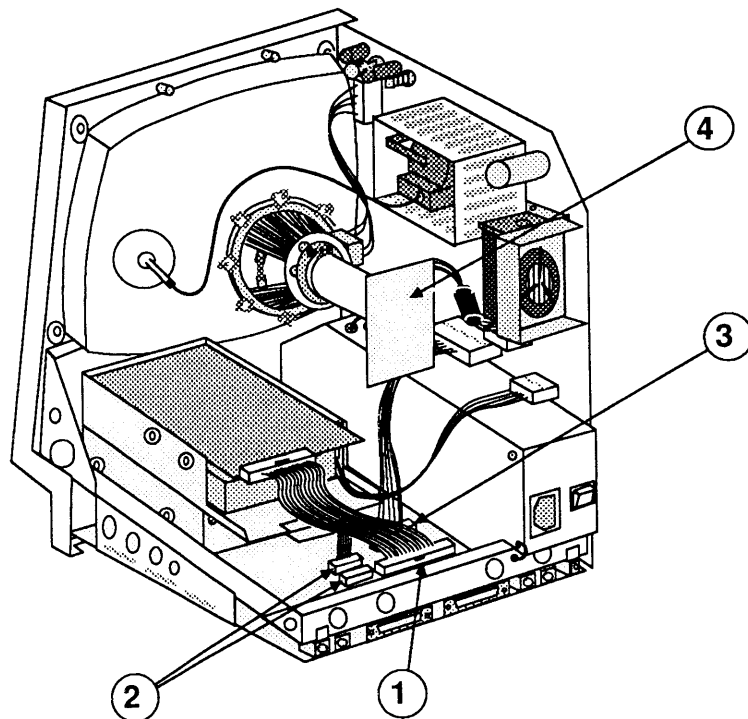
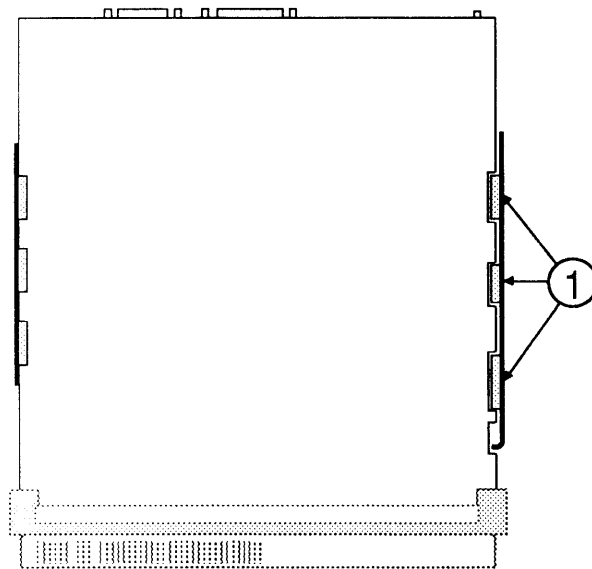


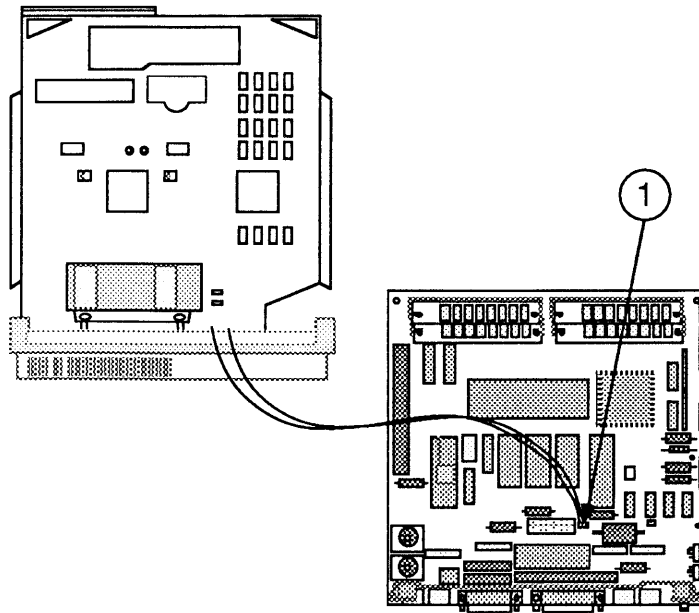
FIGURE 14

5. Remove these connectors from the main logic board:
  - Hard disk drive cable, if present (Figure 14, #1)
  - Internal disk drive cable(s) (Figure 14, #2)
  - Power supply cable (Figure 14, #3) (You must depress the holding clip on this connector before you can pull it out.)
6. Place the Macintosh SE or Macintosh SE/30 face down on a grounded workbench pad, with the bottom of the main logic board facing you. You will see that the right edge of the board is notched and the left edge is smooth.



**FIGURE 15**

7. Holding the board by the edges, slide it up until the tabs on the right edge of the board exactly match the notches in the right metal bracket (Figure 15, #1).
8. Swing the right edge of the board free of the metal bracket and lift the board out of the metal chassis.



**FIGURE 16**

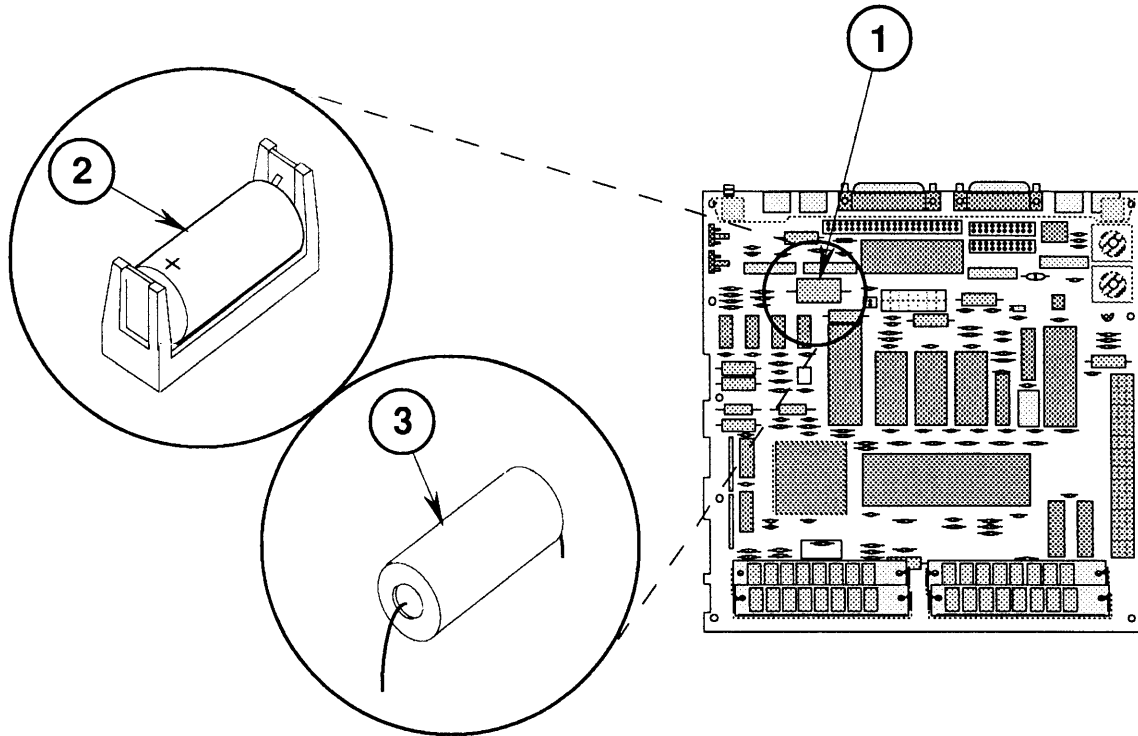
9. With the main logic board held upright beside the computer, disconnect the speaker cable (Figure 16, #1). Place the board on the grounded workbench pad.

### Identifying Macintosh SE Logic Boards

Two logic boards are available as exchange modules for the Macintosh SE. If you are replacing the logic board of a Macintosh SE that was originally shipped with an FDHD drive, use logic board 661-0536. If your customer's computer was originally shipped with an 800K internal drive, or has been **upgraded** to use an FDHD drive, use replacement logic board 661-0526.

**Be sure to use an exchange logic board that is configured the same as the customer's original board.** Use the following procedure to identify the correct exchange module:

1. Identify the customer's battery configuration (Figure 17, #1):
  - a) If the battery is installed in a battery holder (Figure 17, #2), use replacement logic board 661-0536 and go directly to the steps for replacing the logic board (see "Replace").
  - b) If the battery is soldered to the logic board (Figure 17, #3), perform step 2 next.



**FIGURE 17**

2. Identify the customer's disk controller chip (Figure 18, #1):
  - a) If the part number on the disk controller chip is 344-0062 (SWIM chip), use replacement logic board 661-0526 and perform step 3 next.
  - b) If the part number on the disk controller chip **is not** 344-0062, use replacement logic board 661-0526 and go directly to the steps for replacing the logic board (see "Replace").

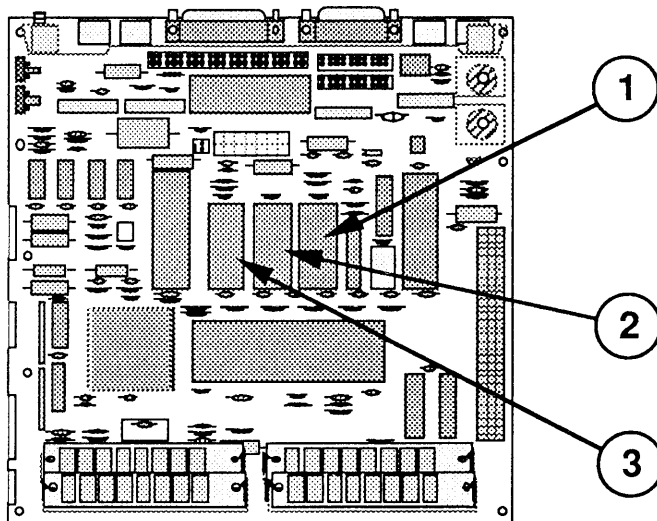


FIGURE 18

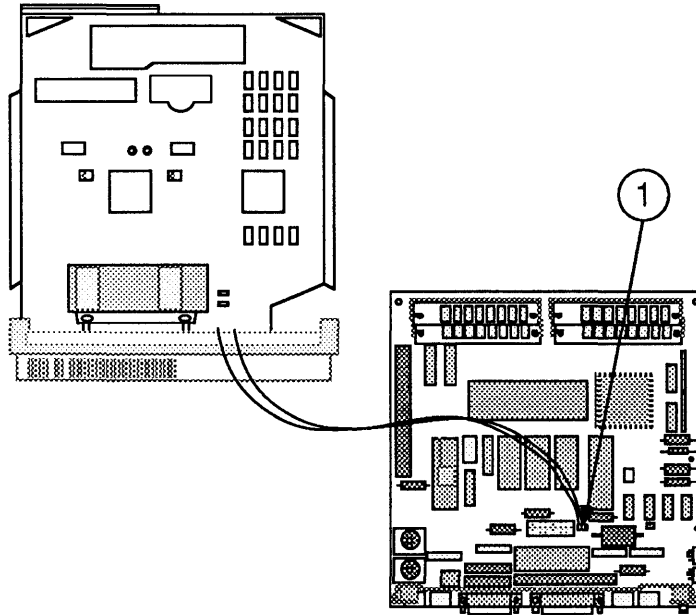
***IMPORTANT:*** Failure to transfer the customer's SWIM chip and upgraded ROMs to the replacement logic board will prevent an FDHD drive from utilizing high-density media.

3. Using the IC extractor, remove the following chips from the customer's logic board and install them in the same positions on the replacement logic board. (The notched end of the chips should face the front of the logic board. For more information see "1.4 MB Apple FDHD Upgrade for the Macintosh SE" in Section 5, Additional Procedures.)
  - SWIM (Figure 18, #1)
  - Low ROM (Figure 18, #2)
  - Hi ROM (Figure 18, #3)

Return the ROMs and IWM chip to Apple on the customer's faulty logic board.

## Replace

1. Position the main logic board at the rear of the Macintosh SE or Macintosh SE/30. The tabbed edge of the board should be on the right.
2. Reconnect the speaker cable (Figure 19, #1) to the main logic board.

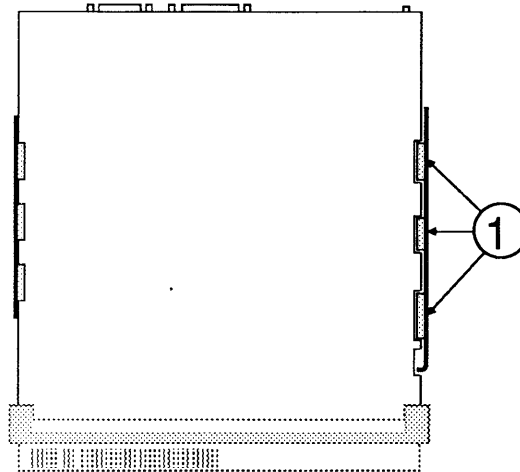


**FIGURE 19**

3. Fit the smooth left edge of the main logic board into the slot in the metal frame.

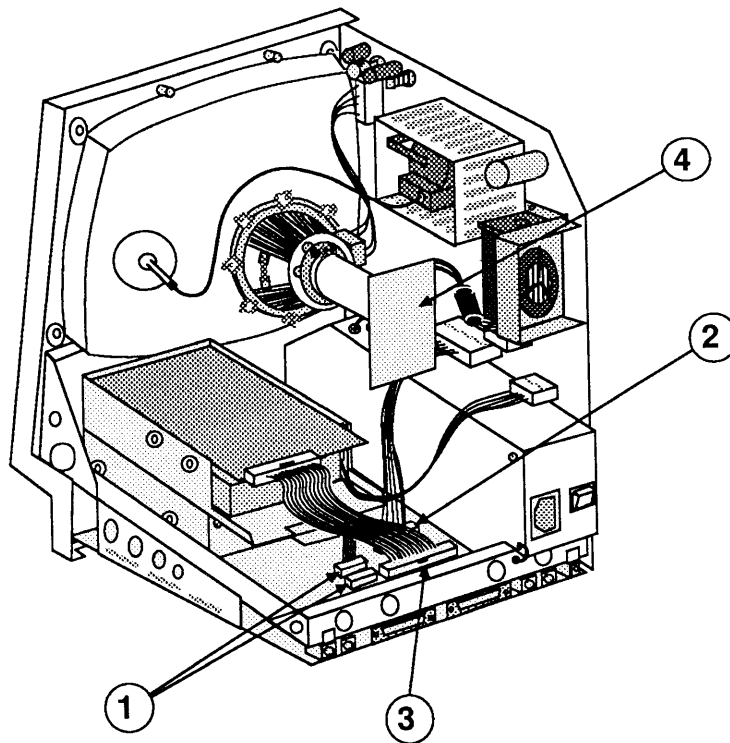


4. Exactly align the tabs on the right edge of the board with the notches on the right metal bracket (Figure 20, #1), and settle the right edge of the board into the right metal bracket. Slide the board down until you hear it click into place.



**FIGURE 20**

5. Place the Macintosh SE or Macintosh SE/30 upright, so that you can see the inside of the chassis.



**FIGURE 21**

6. Reconnect the following to the main logic board:
  - Internal disk drive cable(s) (Figure 21, #1)
  - Power supply cable (Figure 21, #2)
  - Hard disk drive cable, if present (Figure 21, #3)
7. Reconnect the video board (Figure 21, #4) to the neck of the CRT. It fits only one way.
8. Replace the cover.

**Note:** If the diagnostics indicates that the replacement logic board is bad, **and the original board had been upgraded for the FDHD drive**, you may have swapped bad ROM or SWIM chips. Run AppleCAT and observe the test results displayed on the Status line. If any ROM or SWIM chips are faulty, replace the bad chips and reinstall the customer's original logic board.

---

## □ SIMMs

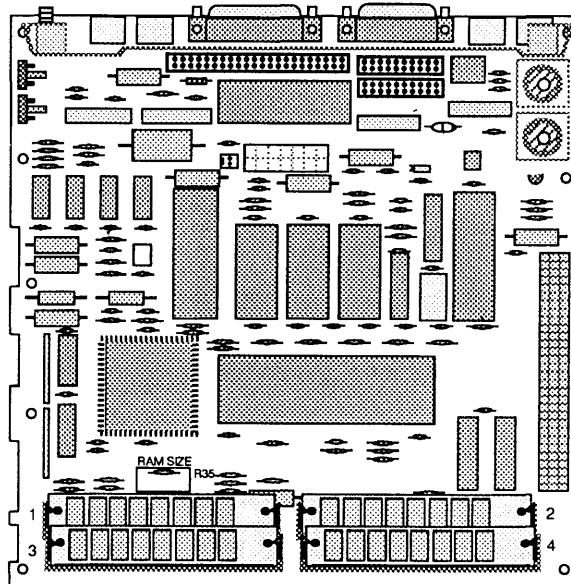
Macintosh SE: The Macintosh SE logic board has four SIMM sockets, as shown in **Figure 22**. It comes with 1 megabyte of RAM installed on four 256K Single In-line Memory Modules (SIMMs), or with 2 megabytes of RAM installed on two 1 MB SIMMs. The original 256K and 1 MB SIMMs for the Macintosh SE are 150 nanosecond; replacement SIMMs are 120 nanosecond. (The 120- and 150-nanosecond SIMMs are interchangeable in the Macintosh SE.)

Macintosh SE/30: The Macintosh SE/30 logic board has two banks of four SIMM sockets, as shown in **Figure 23**. It comes in a 1-megabyte configuration that has four 256K SIMMs installed in bank A, or in a 4-megabyte configuration with four 1 MB SIMMs installed in bank A. All Macintosh SE/30 SIMMs are 120 nanosecond.

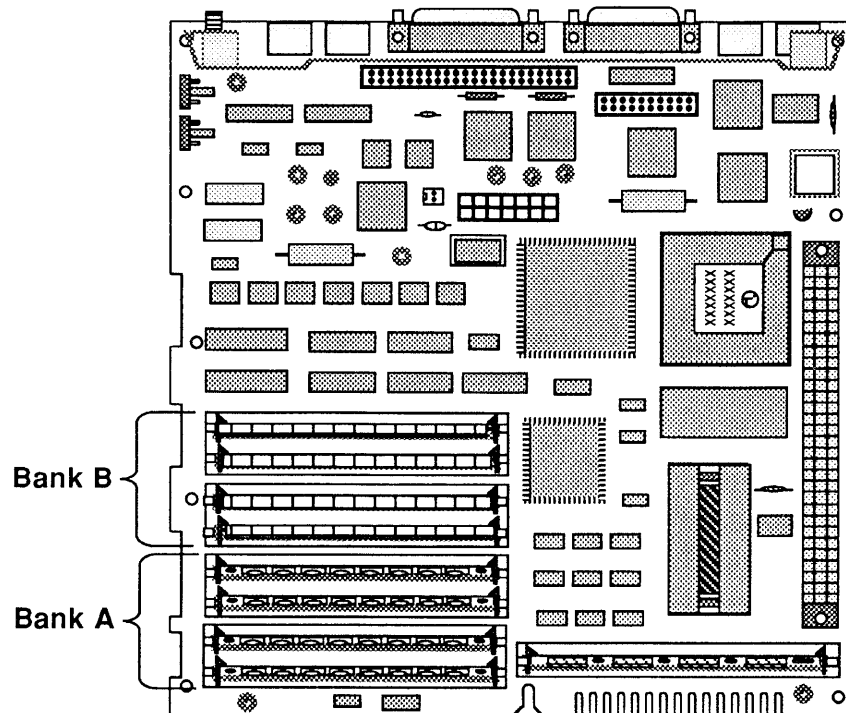
**Note:** Refer to Section 7, Additional Procedures, for procedures specifically addressing memory upgrades.

### Materials Required

Grounded workbench pad and wriststrap



**FIGURE 22**



**FIGURE 23**

## Remove

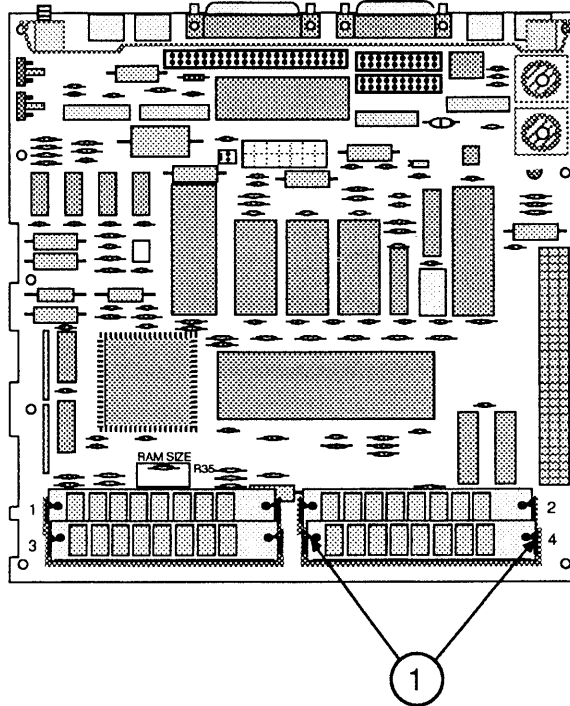
Follow the steps below to remove a SIMM from the main logic board:

1. Remove the cover and discharge the CRT.
2. Put on your grounding wriststrap and place the Macintosh SE or Macintosh SE/30 on the grounded workbench pad. (Never put on the grounding wriststrap until after the CRT has been discharged.)
3. Remove the main logic board.
4. To remove a SIMM, use the SIMM removal tool. See *You Oughta Know* for instruction on tool usage.

---

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

---



**FIGURE 24**

## **Replace**

Follow the steps below to replace a SIMM:

1. With the contacts (Figure 24, #1) on the SIMM pointing down, insert the module into the connector at an angle (bottom forward).
2. Push back on the top corners of the module. You will hear a click when the module snaps into place.
3. Replace the main logic board and the cover.

---

## □ VIDEO BOARD

### Materials Required

Grounded workbench pad and wriststrap  
Torx screwdriver

### Remove

Follow the steps below to remove the video board:

1. Remove the cover.
2. Discharge the CRT.

---

***WARNING:*** *Leave your safety goggles on for the remainder of this procedure.*

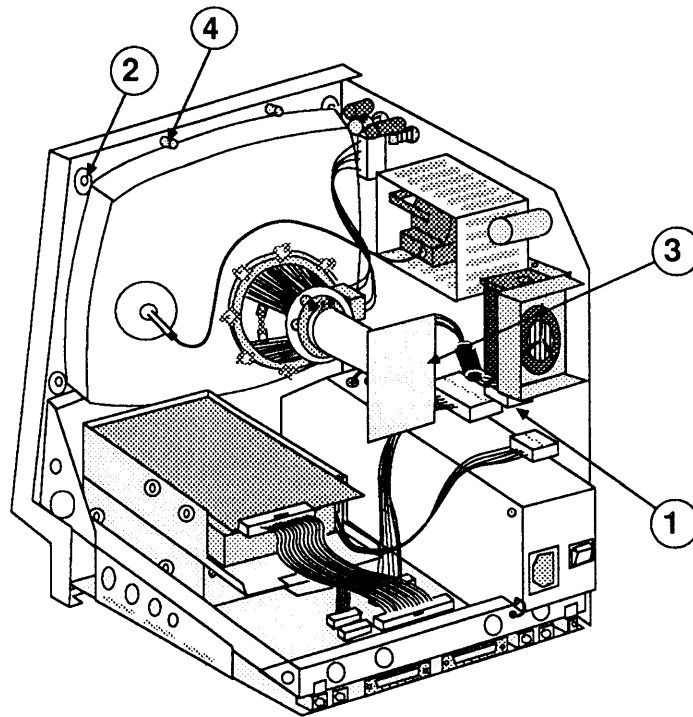
---

3. Put on your grounding wriststrap and place the Macintosh SE or Macintosh SE/30 on the grounded workbench pad. (Never put on the grounding wriststrap until after the CRT has been discharged.)

---

***CAUTION:*** *Whenever working on the upper part of the chassis, always pull the video board off the neck of the CRT or remove it totally. This will help avoid damage to the CRT.*

---



**FIGURE 25**

4. Carefully pull the video board (Figure 25, #3) off the neck of the CRT.
5. Disconnect the video board connector (Figure 25, #1) from the analog board.
6. Remove the Torx screw holding the video ground wire to the upper-left CRT mounting bracket (Figure 25, #2).

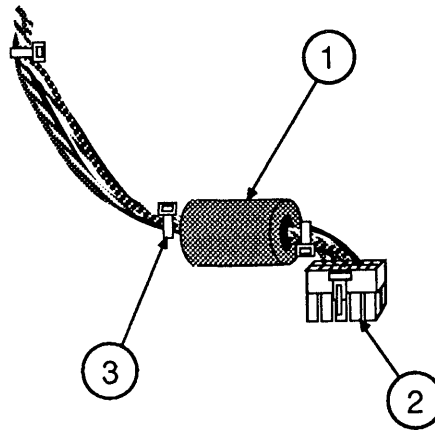
## Replace

---

**CAUTION:** *The redesigned, vertically mounted video board must be installed with the new axial fan. The new axial fan will not allow for adequate vibration clearance when installed with the old, horizontally mounted video board.*

---

New video boards come with an attached ferrite bead (Figure 26, #1) to reduce interference. If your video board does not have a ferrite bead attached to the cable, **and you are installing a new analog board that is packaged with a clip-on ferrite bead**, install the ferrite bead on the video board cable as shown in steps 1 and 2 below.



**FIGURE 26**

1. Position the clip-on ferrite bead (Figure 26, #1) around the video board cable as near the video board connector (Figure 26, #2) as possible. Snap the ferrite bead shut.
2. Install a plastic tie-wrap (Figure 26, #3) on the cable to hold the ferrite bead near the connector. Cut off excess tie-wrap.
3. Place the video ground wire tab over the upper-left CRT mounting bracket and replace the Torx screw (Figure 25, #2). Be sure the ground wire is routed away from the case screw holder (Figure 25, #4).
4. Reconnect the video board connector (Figure 25, #1) to the analog board.

**Note:** A plastic guide may be installed over the leads on the tip of the CRT. If so, pull the guide off before reconnecting the video board to the CRT.

5. Reconnect the video board (Figure 25, #3) to the neck of the CRT. It fits only one way.

**Note:** Before replacing the cover, make sure the video picture is adjusted to the right height and width. Refer to the "Size Adjustments" steps under "Video Adjustments" in Section 3.

6. Replace the cover.



---

## ❑ CATHODE-RAY TUBE (CRT)

### Materials Required

Grounded workbench pad and wriststrap  
Torx screwdriver

### Remove

Follow the steps below to remove the CRT:

1. Remove the cover and discharge the CRT.

---

**WARNING:** *Leave your safety goggles on for the remainder of this procedure.*

---

2. Remove the anode cap.
3. Move the Macintosh SE or Macintosh SE/30 onto a soft, grounded workbench pad and put on your grounding wriststrap. (Never put on the grounding wriststrap until after the CRT is discharged.)
4. Remove the video board.
5. Remove the analog board. (Do not remove the power supply from the analog board.)

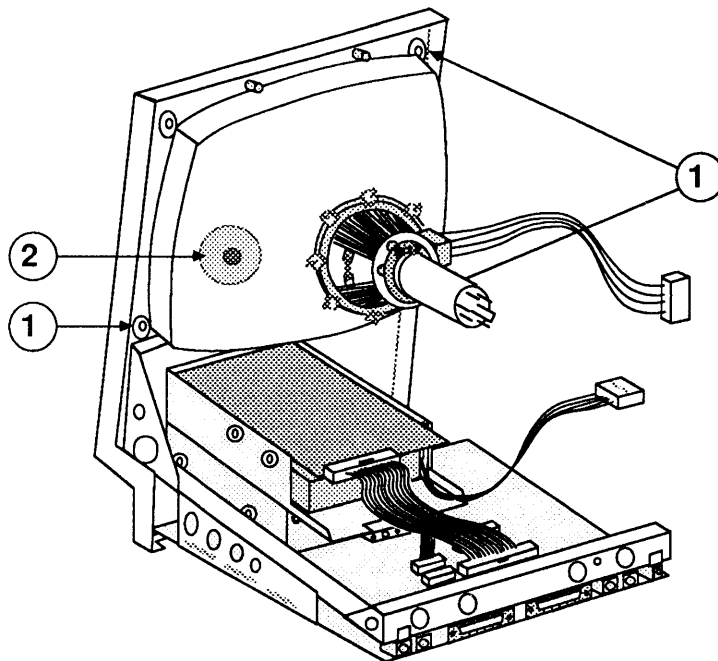


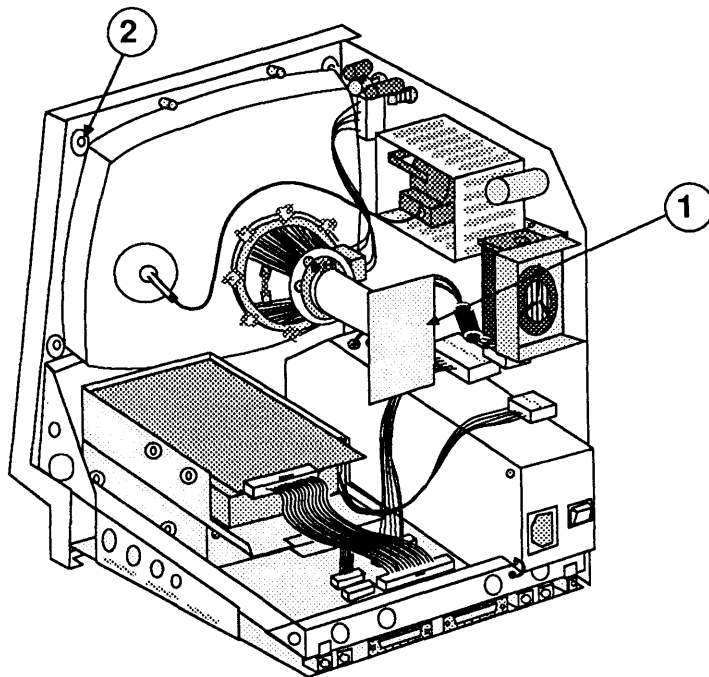
FIGURE 27

6. Using the Torx screwdriver, remove the three remaining mounting screws from the corners of the CRT (Figure 27, #1).
7. Lift the CRT free from the bezel.

## Replace

Follow the steps below to replace the CRT:

1. Place the CRT face down in the bezel, with the anode aperture (Figure 27, #2) on the left, as shown.
2. Replace the three CRT mounting screws shown in Figure 27, #1.

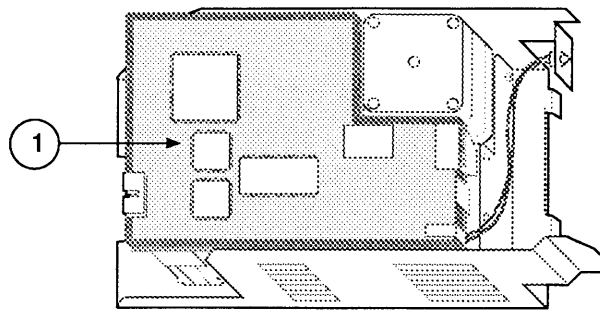


**FIGURE 28**

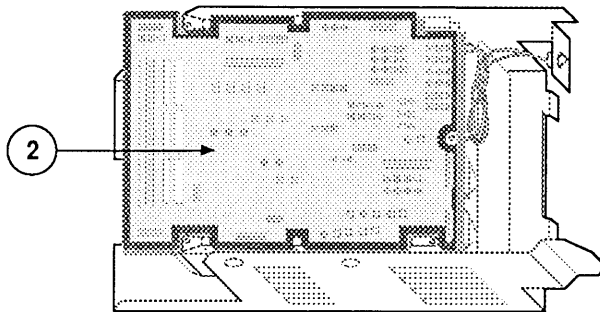
3. Replace the analog board/power supply.
4. Replace the video board (Figure 28, #1).

**Note:** Directions for replacing the fourth CRT mounting screw (Figure 28, #2) are included in the video board procedure.

5. Replace the cover.



Revision A



Revision B

**FIGURE 29**

---

## □ INTERNAL SCSI HARD DISK DRIVE

The Macintosh SE and SE/30 can be configured with a 3.5-inch half-height or a 3.5-inch 1-inch-height SCSI hard disk drive. The procedure for removing all Apple SCSI internal disk drives is the same.

Unlike most drives for the Macintosh SE and SE/30, the 1-inch-height drives are oriented PCB-side down in their carriers; thus, when removing the drive, the SCSI power cable will be opposite its location in Figure 30.

### Identifying 20SC Revision A and B Drives

Apple currently ships two versions of the internal Hard Disk 20SC. To the customer, the Hard Disk 20SC Revision A drive and the Hard Disk 20SC Revision B drive are identical, but **20SC Revision A and Revision B drives must be replaced like-for-like**. To differentiate between drive versions, check their circuit boards. For Revision A drives, the component side of the board is up (Figure 29, #1); for Revision B drives, the solder side is up (Figure 29, #2). For part numbers, refer to Illustrated Parts List or your *Apple Service Programs* binder.

### Materials Required

Grounded workbench pad and wriststrap  
Medium Phillips screwdriver  
Torque driver (for 1-inch-height drives)

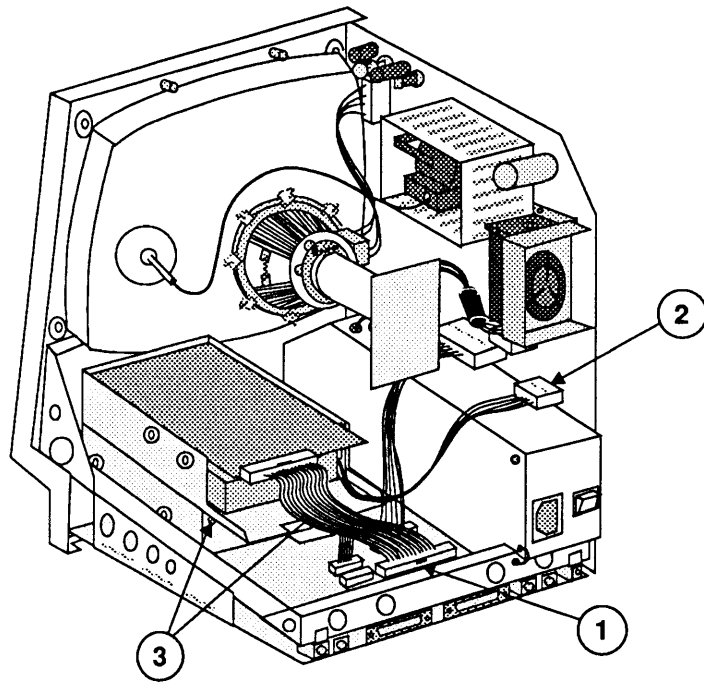
### Remove

Follow the steps below to remove an internal SCSI hard disk drive.

1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE or Macintosh SE/30 onto a soft, grounded workbench pad, and put on your grounding wriststrap. (Never put on the grounding wriststrap until after the CRT is discharged.)
3. Remove the video board.

4. Disconnect the hard disk drive cable from the main logic board (Figure 30, #1).
5. Disconnect the hard disk drive power cable from the analog board (Figure 30, #2).
6. Remove the two Phillips screws that secure the hard disk drive carrier to the lower drive housing (Figure 30, #3), and lift out the hard disk assembly.
7. Before returning the hard disk assembly to Apple, remove the 50-pin SCSI connector cable.

**Note:** There are a number of ways in which damaged hard drives must be returned to Apple. For information on the appropriate return configuration for your drive, see *SCSI Hard Disk Drives Technical Procedures*.



**FIGURE 30**

### Removing the Drive From Its Carrier

To remove a drive from its carrier:

1. Remove the four screws on the lower sides of the carrier (Figure 31).
2. Unplug the LED from the drive, and lift the drive out of the carrier.
3. Package the drive for return to Apple.

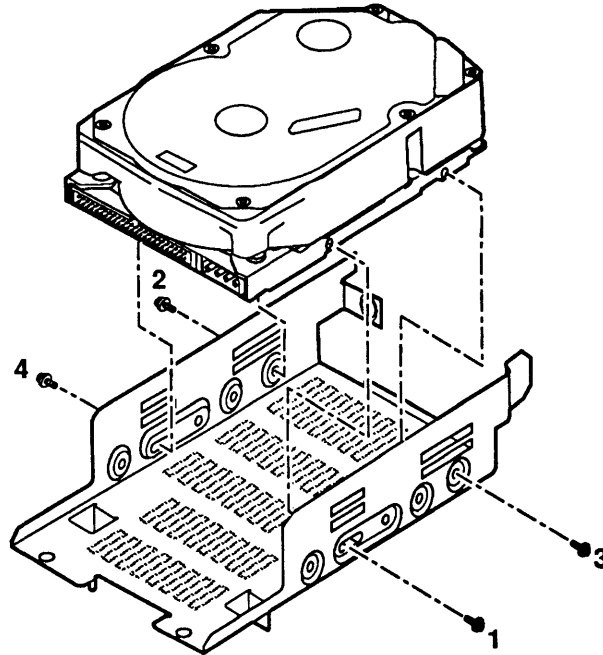


FIGURE 31

### Replacing the Drive In Its Carrier

Most drives can be replaced in a carrier by reversing the steps above. Because of the compact nature of 1-inch height drives, special steps are required when tightening the drives into their carriers. Use the following steps to assure the proper functioning and longevity of these drives.

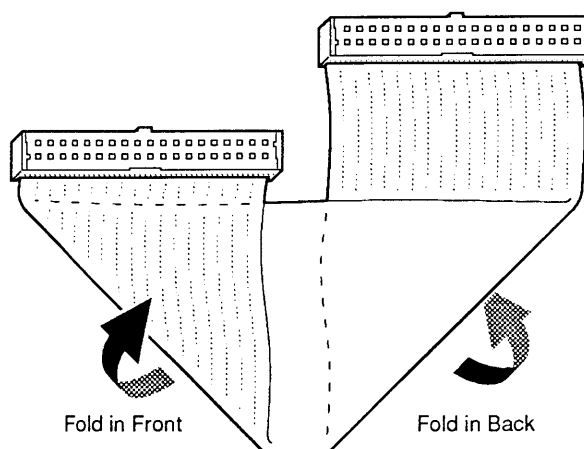
1. Plug the LED into the drive.
2. Using the Phillips screws that you removed in step 1, loosely secure the drive in its carrier.
3. Tighten the screws in the sequence shown in Figure 31, torquing the four screws to 8.0 in-lbs.

## Replace

1. Replace the 50-pin SCSI connector cable on the hard disk assembly.

**Note:** If you are using the carrier with low side-mounting holes (see Figure 31), the key on the hard disk SCSI connector will be inverted. To make the hard disk drive cable fit properly, fold one end of the cable forward and the other end backward into the shape shown in Figure 32.

2. Slide the hard disk assembly over the lower drive so that the tabs on the bottom of the hard drive carrier mesh with the top holes on the lower drive housing.
3. Replace the two screws that secure the hard disk carrier to the lower drive housing (Figure 30, #3).
4. Reconnect the hard disk drive power cable to the analog board (Figure 30, #2).
5. Reconnect the hard disk SCSI connector to the main logic board (Figure 30 #1).
6. Replace the video board.
7. Replace the cover.



**FIGURE 32**

---

## □ LED CABLE ASSEMBLY

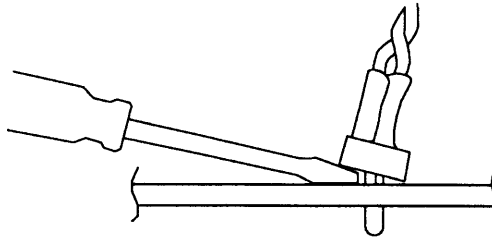
### Materials Required

#2 jeweler's screwdriver

### Remove

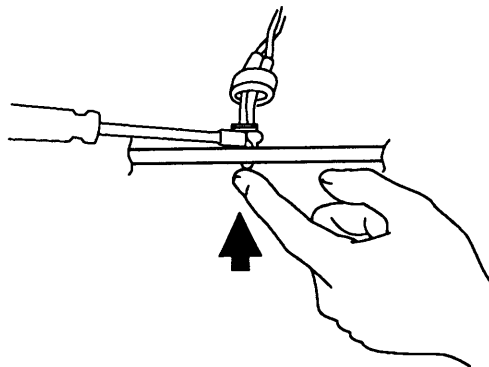
To remove the LED cable assembly:

1. Remove the cover and discharge the CRT.
2. Remove the hard disk assembly.



**FIGURE 33**

3. Pry the small plastic retaining ring from around the LED holder with a jeweler's screwdriver (Figure 33). Slide the retaining ring up the wires and out of the way.



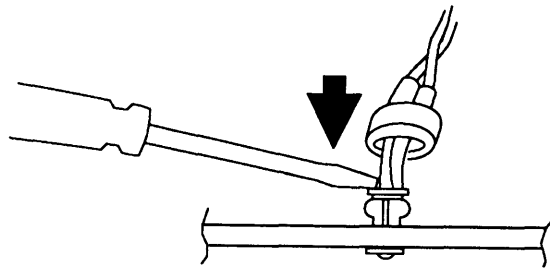
**FIGURE 34**

4. Press the face of the LED toward the inside of the metal frame while gently prying apart the LED holder with the screwdriver until the LED snaps free of the metal frame (Figure 34).
5. Disconnect the LED connector from the hard drive assembly, and remove the LED cable assembly.



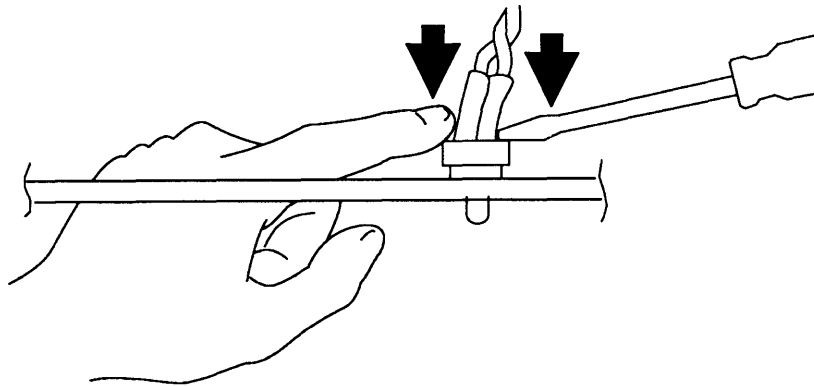
## Replace

To replace the LED cable assembly:



**FIGURE 35**

1. If necessary, slip the LED into its holder and snap it into place with a jeweler's screwdriver (Figure 35).



**FIGURE 36**

2. Slide the retaining ring down the wires and position it around the LED holder. Push the ring back into place with the screwdriver (Figure 36).
3. Connect the LED cable to the LED connector on the controller board.
4. Replace the hard disk assembly.
5. Replace the cover.

---

## □ UPPER INTERNAL DISK DRIVE

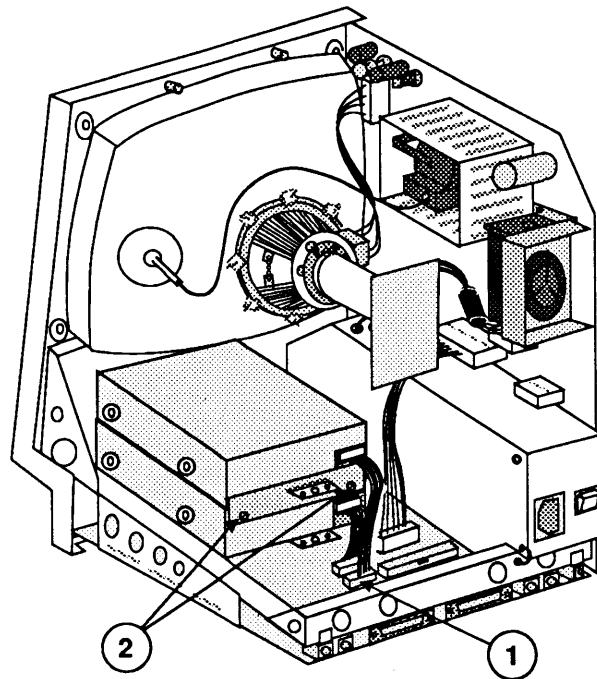
### Materials Required

Grounded workbench pad and wriststrap  
Medium Phillips screwdriver

### Remove

Follow the steps below to remove the optional upper internal drive from the Macintosh SE (only):

1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE onto a soft, grounded workbench pad and put on your grounding wriststrap. (Never put on the grounding wriststrap until after the CRT is discharged.)



**FIGURE 37**

3. Remove the video board.
4. Disconnect the upper internal disk drive cable from connector J7 on the main logic board (Figure 37, #1).
5. Remove the two screws (Figure 37, #2) from the metal bracket that holds the two drive housings together. Lift off the metal bracket.
6. Slide the upper internal drive forward and lift it out.

## Replace

1. Remove the dummy packing disk from the replacement internal drive mechanism.

---

**IMPORTANT:** Apple strongly advises the use of dust shields on 1.4 MB floppy drives in all Macintosh SE and SE/30 computers. All 1.4 MB replacement drives ship with the dust shield already installed. If you plan to install a dust shield on a current drive, however, you **must** clean the drive first. Follow the procedure in "Cleaning the Drive" in the Basics section of the FDHD/SuperDrive tab of the Apple Service Technical Procedures.

---

2. To place the upper drive into the chassis over the installed lower drive, slide the upper internal drive forward, then back over the lower internal drive so that the tabs on the top of the lower drive housing mesh with the holes on the bottom of the upper drive housing (Figure 38, #1).

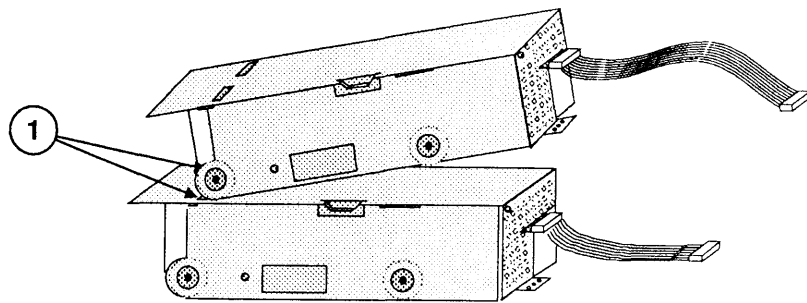


FIGURE 38

3. Place the metal bracket over the two drive housings so that the slot in the bracket (Figure 39, #1) fits over the tab on the upper housing.

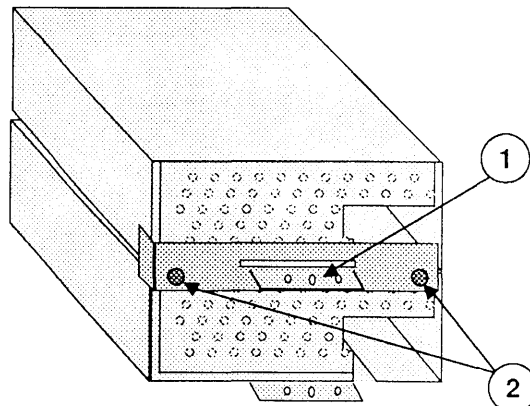
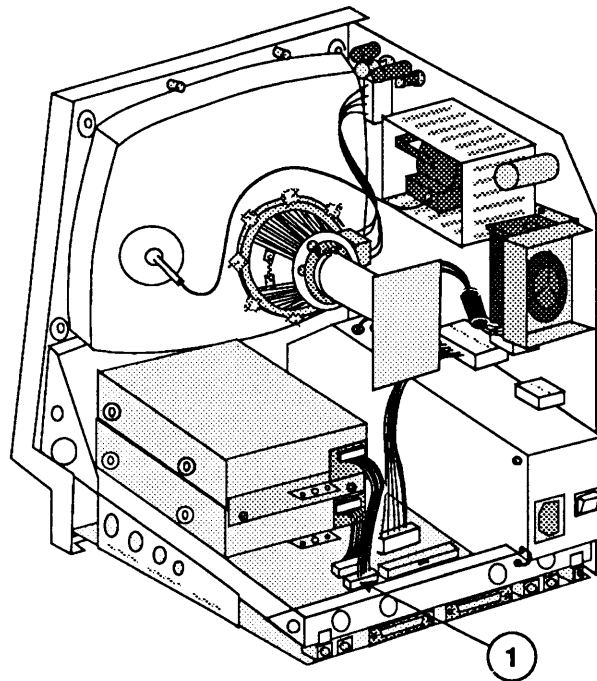


FIGURE 39

4. Replace the two Phillips screws (Figure 39, #2) that secure the metal bracket to the lower internal drive housing.



**FIGURE 40**

5. Reconnect the upper internal disk drive cable to connector J7 on the main logic board (Figure 40, #1).

**Note:** You must use the longer of the two available yellow-coded internal disk drive cables for the upper drive. The shorter cable will not reach to the main logic board. (The two cables are identical except for length.)

6. Replace the video board.
7. Replace the cover.

---

## ❑ LOWER INTERNAL DISK DRIVE

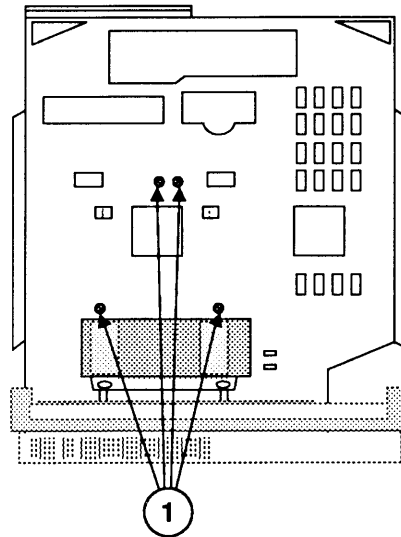
### Materials Required

Grounded workbench pad and wriststrap  
Medium Phillips screwdriver

### Remove

Although the disk drives may be different, follow the steps below to remove the lower internal disk drive from a Macintosh SE or from a Macintosh SE/30.

1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE or Macintosh SE/30 onto a soft, grounded workbench pad and put on your grounding wriststrap. (Never put on a grounding wriststrap until after the CRT is discharged.)
3. Remove the video board.
4. Remove the hard disk drive or upper internal drive, whichever is present.
5. Remove the main logic board.



**FIGURE 41**

6. With the bottom of the chassis facing you, remove the four Phillips screws (Figure 41, #1) that secure the lower internal drive to the bottom of the metal chassis. Lift the drive free.

## Replace

1. Remove the dummy packing disk from the replacement drive mechanism.

---

**IMPORTANT:** Apple strongly advises the use of dust shields on 1.4 MB floppy drives in all Macintosh SE and SE/30 computers. All 1.4 MB replacement drives ship with the dust shield already installed. If you plan to install a dust shield on a current drive, however, you **must** clean the drive first. Follow the procedure in "Cleaning the Drive" in the Basics section of the FDHD/SuperDrive tab of the Apple Service Technical Procedures.

---

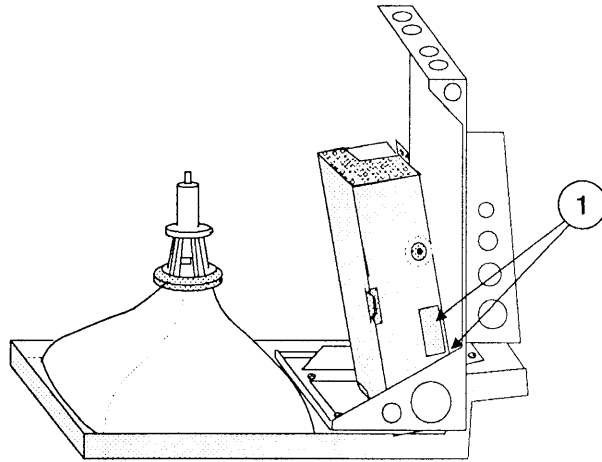


FIGURE 42

2. Place the drive into the chassis so that the tabs on the bottom of the metal drive housing fit into the holes provided in the chassis frame (Figure 42, #1).
3. Replace the four Phillips screws (Figure 41, #1) that secure the internal drive to the bottom of the metal chassis.
4. Replace the main logic board.
5. Replace the hard disk or upper internal drive.
6. Replace the video board.
7. Replace the cover.

---

## □ FAN ASSEMBLY

---

**CAUTION:** *There are two fan styles: the older cross-flow (cylindrical) fan and the newer axial (round) fan. The axial fan, since it is wider, must be installed with the redesigned, vertically mounted CRT video board. The axial fan will not allow adequate vibration clearance with the old, horizontally mounted CRT video board.*

---

### Materials Required

Grounded workbench pad and wriststrap  
Exacto knife  
Soldering iron  
Torx screwdriver

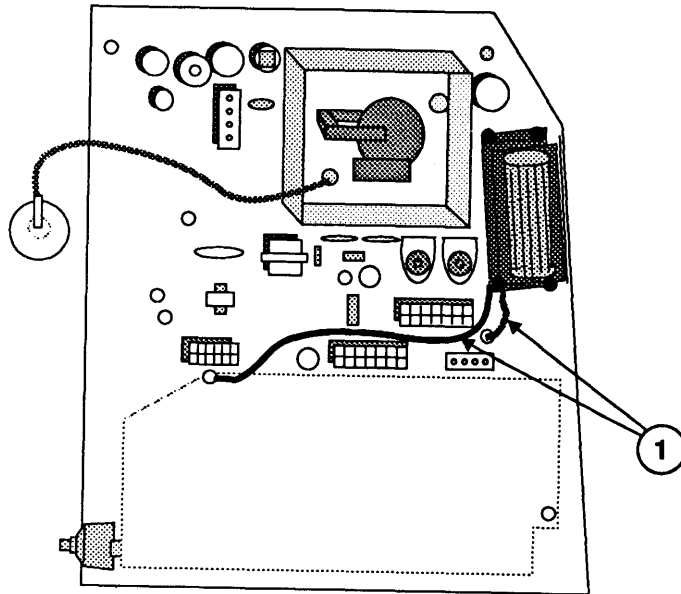
### Remove

Follow the steps below to remove the fan assembly:

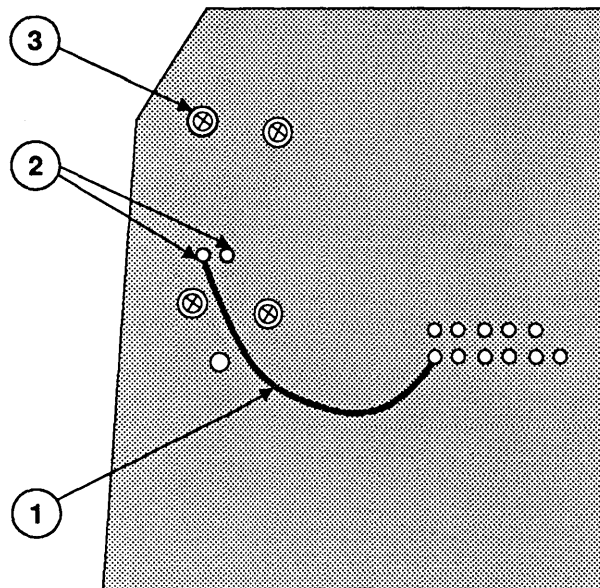
1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE or Macintosh SE/30 onto a soft, grounded workbench pad and put on your grounding wriststrap. (Never put on a grounding wriststrap until after the CRT is discharged.)
3. Remove the video board.
4. Remove the analog board.
5. Remove the power supply from the analog board.
6. Remove the fish paper from the board. (To do this, compress and remove the arrow clips.)
7. The electrical connection of the fan to the analog board has been achieved in several different ways. In most designs, one or two wires from the fan are soldered to the analog board. First check to see if any wires are present. They may be routed along the front (Figure 43, #1) or the back (Figure 44, #1) of the analog board.

If there are **no** fan wires, go to step 8.

If a wire or wires are present, locate the solder point(s) on the back of the board and desolder them. Using the exacto knife, cut away any excess bonding material holding the wire(s) in place.



**FIGURE 43**



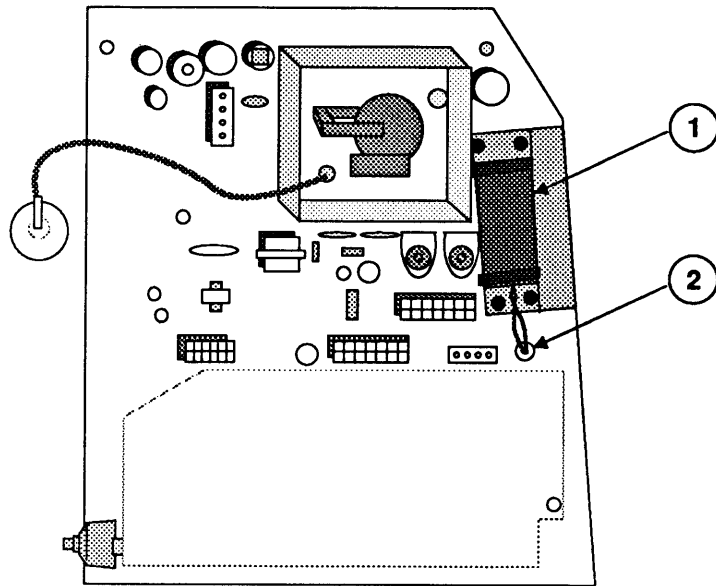
**FIGURE 44**

8. Next, locate the two solder points (Figure 44, #2) on the back of the board that connect to the fan, and desolder if there is solder present.
9. Remove the four screws (one is shown at Figure 44, #3) that hold the fan assembly to the analog board and lift the fan off.



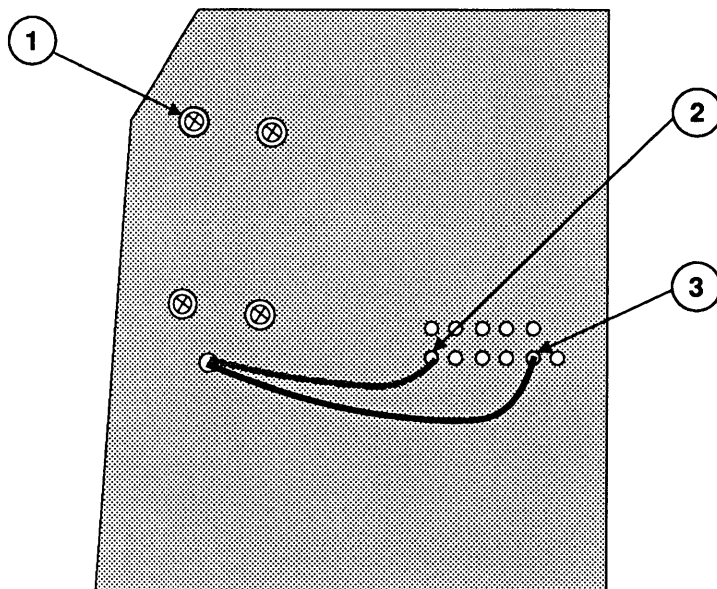
## Replace

1. Orient the new (axial) fan assembly (Figure 45, #1) so that the holes in the bracket match the screw holes on the analog board.



**FIGURE 45**

2. Holding the fan in place, turn the analog board over and install the four mounting screws (one is shown in Figure 46, #1).



**FIGURE 46**

3. Route the two fan wires through the hole below the fan on the analog board (Figure 45, #2).

**Note:** This hole was used for the insertion of one of the arrow clips that hold the fish paper on the board. The arrow clip for this hole can no longer be used.

4. On the noncomponent side of the board, solder the black wire to the first lower solder point (Figure 46, #2) of connector P3.
5. On the noncomponent side of the board, solder the yellow wire to the fifth lower solder point (Figure 46, #3) of connector P3.
6. Replace the fish paper by reinstalling the arrow clips. (Do not put an arrow clip in the hole shown in Figure 45, #2.)
7. Replace the power supply.
8. Replace the analog board.
9. Replace the video board.

---

**CAUTION:** *The redesigned, vertically mounted video board must be installed with the new axial fan. The new axial fan will not allow for adequate vibration clearance when installed with the old, horizontally mounted video board.*

---

10. Replace the cover.

---

## □ SPEAKER, FRONT BEZEL, AND SLOT COVER

### Materials Required

Grounded workbench pad and wriststrap  
Exacto knife  
Soldering iron  
Torx screwdriver

### Remove

Follow the steps below to remove the speaker, slot cover, or bezel from a Macintosh SE (only):

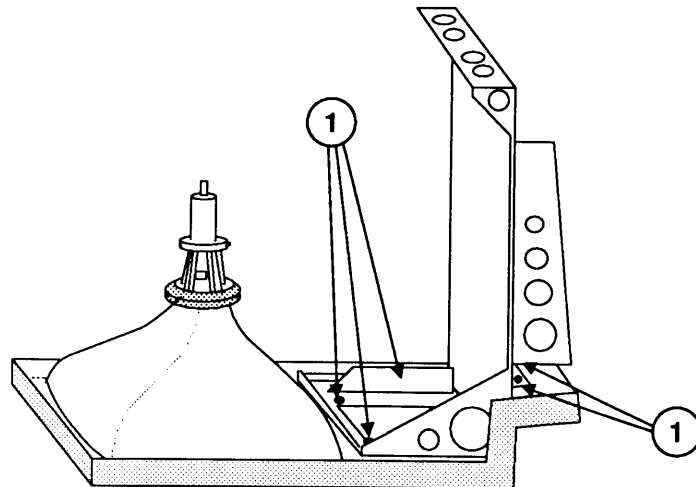
1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE onto a soft, grounded workbench pad and put on a grounding wriststrap (**after** discharging the CRT).
3. Remove the video board and the main logic board.
4. Remove the analog board. (Do not remove the power supply from the analog board.)

---

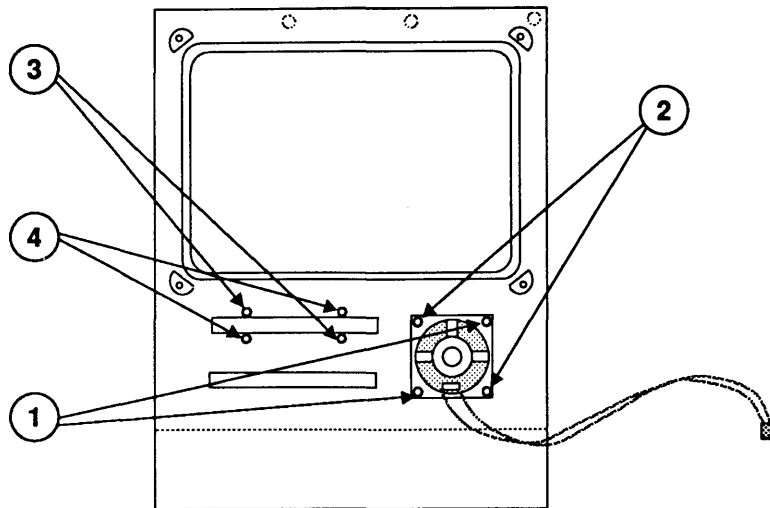
**WARNING:** *The edges of the metal chassis may be sharp. Handle the metal chassis carefully.*

---

5. Remove five Torx screws (Figure 47, #1) and lift out the metal chassis with hard disk and/or drive(s).
6. If you are removing the speaker, use an exacto knife to cut away the melted plastic that secures two corners of the speaker to the inside of the front bezel (Figure 48, #1), and lift the speaker out.



**FIGURE 47**



**FIGURE 48**

7. If you are removing the slot cover from a Macintosh SE, use an exacto knife to cut away the melted plastic that secures two corners of the slot cover to the inside of the front bezel (Figure 48, #3). Gently push the slot cover through the slot and lift it out.
8. If you are removing the bezel, first remove the CRT.

## Replace

Follow the steps below to replace the speaker, slot cover, or bezel:

1. Place the bezel face down on the grounded workbench pad.
2. If you are replacing the speaker, position the speaker in the bezel (see Figure 48). Touch a heated soldering iron to the two previously unmelted plastic posts that now protrude through the corners of the speaker (Figure 48, #2). The plastic will spread as it melts, then harden and hold the speaker in place.
3. If you are replacing the slot cover on a Macintosh SE, position the slot cover in the bezel (see Figure 48) with the plastic LED window beside the small hole on the front bezel. Touch a heated soldering iron to the two unmelted plastic posts on the slot cover (Figure 48, #4). The plastic will melt, then harden and hold the slot cover in place.

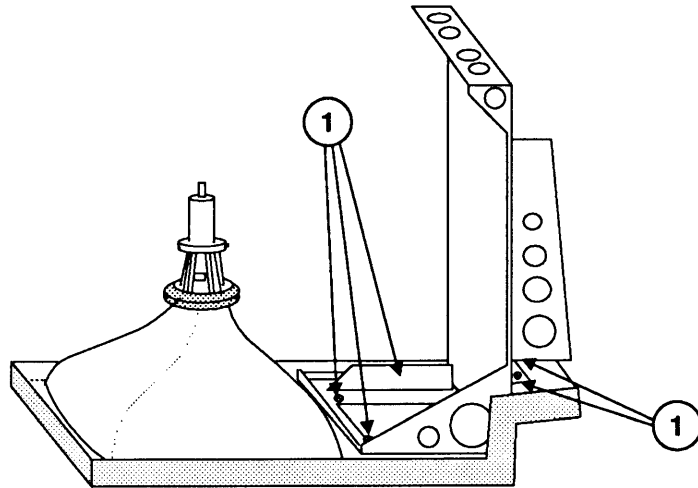
4. Replace the CRT, if you removed it.

---

***WARNING: The edges of the metal chassis may be sharp. Handle the metal chassis carefully.***

---

5. Replace the metal chassis, with disk and/or SCSI drive(s) attached, and fasten it to the bezel with the five Torx screws (Figure 49, #1).



**FIGURE 49**

6. Replace the analog board.
7. Replace the main logic board.
8. Replace the video board.
9. Replace the cover.

# Macintosh SE and Macintosh SE/30

## Section 3 – Adjustments

---

### □ CONTENTS

3.2	Yoke Adjustments
3.2	Introduction
3.2	Materials Required
3.3	Tilt Adjustment
3.3	Centering Ring Adjustment
3.4	Video Adjustments
3.4	Introduction
3.4	Materials Required
3.5	Adjustment Procedures

---

## □ YOKE ADJUSTMENTS

### Introduction

In infrequent cases, you may need to adjust the yoke of the Macintosh SE or Macintosh SE/30 after you replace the CRT. To see if the yoke needs adjusting, turn the power on and look at the CRT screen. If the picture is tilted, correct it using the tilt adjustment. If the picture is off center, use the centering rings adjustment.

Yoke adjustments are made while standing behind the Macintosh SE or Macintosh SE/30, so you must position a mirror so that you can see the screen. **Because of the high voltage danger, do not try to make live adjustments by facing the screen and reaching around the computer; you can't see what your hands are going to touch.**

### Materials Required

Small Phillips screwdriver  
Safety goggles  
CRT discharge tool  
Soft cloth or foam pad  
Mirror  
Exacto knife

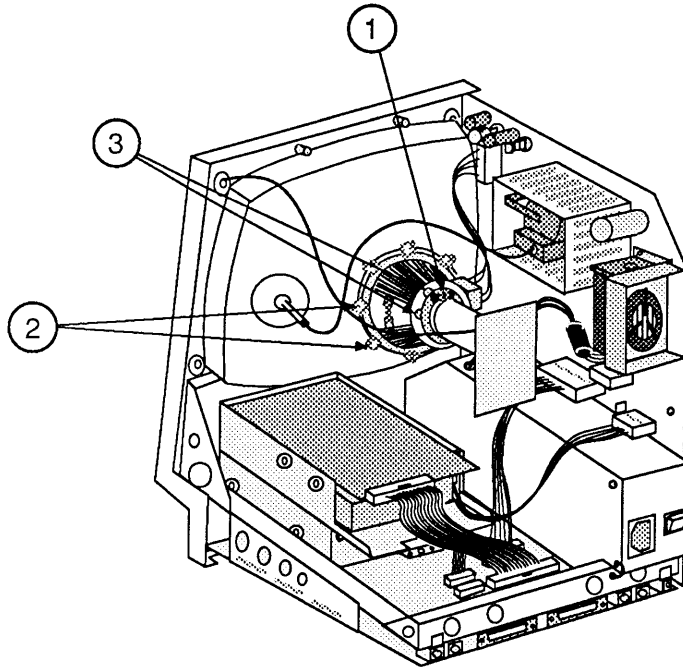


FIGURE 1

---

**WARNING:** Read the safety precautions in Section 1, Basics, before performing adjustments. Failure to follow the safety rules could result in serious injury.

---

## Tilt Adjustment

1. Put on safety goggles and remove all metal jewelry. If you are wearing a grounding wriststrap, remove it.
2. Remove the cover and discharge the CRT. (Refer to Section 2, Take-Apart.)
3. Turn the computer with its back facing you, and position the mirror with the CRT screen in the mirror.
4. Loosen the yoke clamp screw (Figure 1, #1) at the top of the CRT neck two or three turns.
5. Connect the power cord and turn the power on.
6. Put one hand behind your back and with your other hand grasp only the plastic spokes of the yoke collar (Figure 1, #2). Rotate the yoke until the top and bottom edges of the picture appear parallel with the top and bottom edges of the bezel.
7. Turn the power off, unplug the computer, and discharge the CRT again.
8. Hold the yoke collar in the position you just determined in Step 6 and carefully tighten the yoke clamp screw just enough so that the yoke cannot slip. Do not overtighten.
9. Replace the cover.
10. Connect the power cord and turn the power on to make sure the tilt adjustment is still correct.

## Centering Ring Adjustment

1. Put on safety goggles and remove all metal jewelry. If you are wearing a grounding wriststrap, remove it.
2. Remove the cover and discharge the CRT. (Refer to Section 2, Take-Apart.)
3. Turn the Macintosh SE or Macintosh SE/30 so that its back is facing you, and position the mirror so that the CRT screen is visible in the mirror. ||
4. Locate the two centering rings on the yoke assembly (Figure 1, #3). The adjustment of these rings determines whether the picture is centered or offset to one side.

**Note:** If a bonding material is holding these rings in place, break it using an exacto knife.

5. Connect the power cord and turn the power on.



6. Center the picture by first holding the front centering ring steady and moving the rear ring, then holding the rear ring steady and moving the front ring.
7. When the picture is perfectly straight and centered, turn the power off, remove the power cord, and again discharge the CRT.
8. Replace the cover.
9. Plug in the power cord, turn the computer power on, and view the screen to ensure that the centering adjustment is still correct.

---

## □ VIDEO ADJUSTMENTS

### Introduction

Video adjustments **may** be necessary whenever the CRT, the analog board, the video board, or the power supply is replaced.

### Materials Required

Safety goggles  
Plastic alignment tool (or "tweaker")  
Mirror  
Ruler

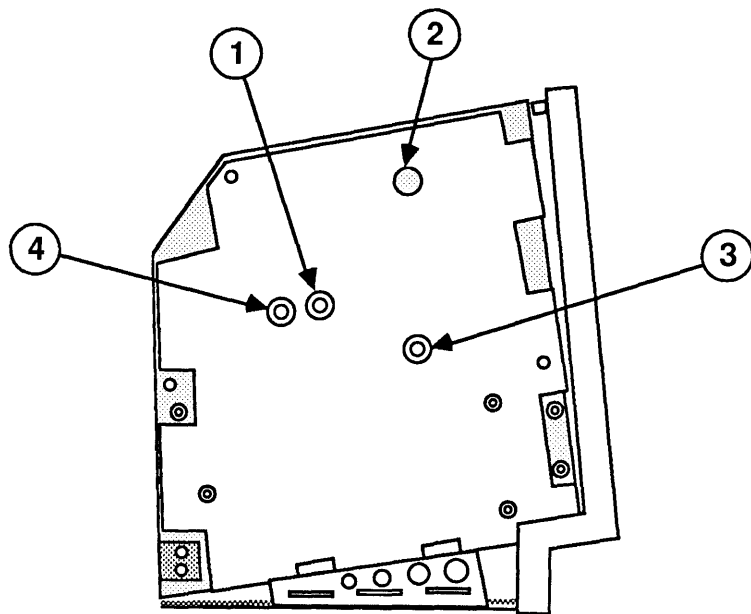


FIGURE 2

## Adjustment Procedures

1. Put on safety goggles and remove all metal jewelry. If you are wearing a grounding wriststrap, remove it.
2. Remove the cover and discharge the CRT. (Refer to Section 2, Take-Apart.)
3. Turn the computer with the side of the analog board facing you, and position the mirror so that the CRT screen is visible in the mirror.
4. Connect the power cord and turn the power on.

### Brightness and Contrast

5. Turn the contrast control fully clockwise. (The contrast control is on the front of the computer, on the left side, under the Apple logo.)
6. Adjust the brightness control (Figure 2, #1) with the alignment tool: turn it fully counterclockwise so that white lines are visible on the screen. Then turn it back in the opposite direction until the white lines just disappear.
7. Turn the contrast control on the front panel slightly counterclockwise. This is the ideal adjustment.

### Size Adjustments

8. Use the plastic alignment tool to adjust the width (Figure 2, #2) until the picture is approximately 7 inches wide.
9. Use the plastic alignment tool to adjust the height (Figure 2, #3) until the picture is approximately 4.7 inches high.

### Focus Adjustment

10. Turn the focus adjustment (Figure 2, #4) all the way clockwise until it doesn't turn anymore. Now turn it back in the opposite direction (counterclockwise) one-eighth of a turn. This setting gives the best overall sharpness at all points on the screen.

(

(

(

# Macintosh SE and Macintosh SE/30

## Section 4 – Diagnostics

---

### □ CONTENTS

- 4.2 Introduction to *MacTest SE* and *MacTest SE/30*
- 4.2 Program Similarities
- 4.3 Program Differences
- 4.4 Making Backup Disks
- 4.4 Copying *MacTest SE* and *MacTest SE/30* Disks
- 4.6 Running *MacTest SE* and *MacTest SE/30*
- 4.6 Materials Required
- 4.6 Starting *MacTest SE* and *MacTest SE/30*
- 4.8 Installing the Loopbacks
- 4.9 Using the *MacTest SE* and *SE/30* Menus
- 4.14 Running the Tests
- 4.16 Introduction to *AppleCAT SE* and *AppleCAT SE/30*
- 4.17 Running *AppleCAT SE* and *AppleCAT SE/30*
- 4.17 Materials Required
- 4.17 Setting Up Test Station and UUT
- 4.20 Establishing Communication
- 4.22 Using the *AppleCAT* Menus
- 4.26 Running the Tests
- 4.28 Repair Confirmation Codes
- 4.29 SCSI Loopback Jumper Procedure
- 4.29 To Determine If a Jumper Is Needed
- 4.30 To Install the Jumper

---

## □ INTRODUCTION TO MACTEST SE AND MACTEST SE/30

*MacTest™ SE* (version 3.0 or higher) is part of the *AppleCAT™ SE* diagnostic set that is used for testing Macintosh SE systems. *MacTest SE/30* (version 1.0 or higher) is part of the *AppleCAT SE/30* diagnostic set for testing Macintosh SE/30 systems. Both *MacTest SE* and *MacTest SE/30* may also be used as standalone functional tests of their respective systems.

### Program Similarities

When used as standalone tests, *MacTest SE* and *MacTest SE/30* perform pass/fail functional tests of the Macintosh SE and Macintosh SE/30 systems, respectively. *MacTest SE* and *MacTest SE/30* are run the same, but *MacTest SE/30* tests Macintosh SE/30 components that do not exist in the Macintosh SE.

Initially, both *MacTest SE* and *MacTest SE/30* allow you to select the tests you want to run. As each 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 run to completion. The test then terminates and returns to the Finder (desktop).

Both *MacTest SE* and *MacTest SE/30* also provide test patterns for use in adjusting the CRT. **Neither *MacTest SE* nor *MacTest SE/30* tests an internal SCSI hard disk.** To test the hard disk, use the *Macintosh Hard Disk Drive Diagnostic* disk (see Section 3, Diagnostics, in the *SCSI Hard Disk Drives Technical Procedures*).

## Program Differences

Because of configuration differences between the Macintosh SE and Macintosh SE/30 systems (see Basics), *MacTest SE* and *MacTest SE/30* test different components.

### *Components Tested by MacTest SE*

*MacTest SE* tests the following Macintosh SE components:

- Macintosh SE main logic board, including:
  - RAM
  - VIA
  - SCC
  - Clock
  - Sound chip
- Internal and external disk drives
- Keyboard and mouse
- SCSI bus
- Apple PC 5.25 Drive and Macintosh SE-Bus PC Card

The internal 96-pin Euro-DIN expansion bus connector on the Macintosh SE logic board cannot be tested unless an expansion card is connected to the expansion bus. When a Macintosh SE-Bus PC Card and an Apple PC 5.25 Drive are installed, *MacTest SE* can test the card, drive, and expansion bus at the same time.

### *Components Tested by MacTest SE/30*

*MacTest SE/30* tests the following Macintosh SE/30 components:

- Macintosh SE/30 main logic board, including:
  - RAM
  - VIA
  - SCC
  - PMMU
  - FPU
  - Clock
  - Sound chip
- Internal and external disk drives
- Keyboard and mouse
- SCSI bus
- Video RAM

---

## □ MAKING BACKUP DISKS

**Make a backup of the original *MacTest SE* or *MacTest SE/30* diagnostic disk before you begin!** When testing a defective Macintosh SE or Macintosh SE/30, it is possible to damage or erase a section of the *MacTest* disk.

**You can make backup copies on any Macintosh,** regardless of which *MacTest* program you are copying. For example, you can copy the *MacTest SE* disk using a Macintosh Plus or a Macintosh II. The copy does not have to be made on the Macintosh SE.

### Copying MacTest SE and MacTest SE/30 Disks

**Use Finder to make a backup copy of the *MacTest SE* or *MacTest SE/30* diagnostic disk.** When copying the *MacTest SE* or *MacTest SE/30* disk, be sure to **copy the entire disk** and not just the *MacTest* program. The *MacTest SE* and *MacTest SE/30* disks contain specific versions of the System and Finder, and are not guaranteed to run with other versions. Also, **be sure to copy *MacTest SE* and *MacTest SE/30* to 800K disks only.**

### Using Your Backup Disk

Take the following precautions when using your *MacTest SE* or *MacTest SE/30* disk copy:

- **Do not write-protect your working copy of the *MacTest SE* or *MacTest SE/30* disk.** The program will not run correctly if you do.
- **Do not replace the System or Finder provided on the *MacTest* disk.** The versions used on the disk are Finder 6.1 and System 6.0.2. *MacTest SE* and *MacTest SE/30* are not guaranteed to work with other versions of the System and Finder.

- **Do not change the name of the diagnostic program on the disk.** During logic board testing, the machine reboots, looks for, and restarts the diagnostic named *MacTest SE* (or *MacTest SE/30*, if you are testing that system). 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 SE* or *MacTest SE/30* window does not reappear after a logic board test, check the name of the diagnostic's icon on the desktop. Correct it to *MacTest SE* (or *MacTest SE/30*), and 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 SE* (or *MacTest SE/30*), click **OK**. Then double-click on the corrected *MacTest SE* or *MacTest SE/30* icon to return to the test program.



---

## ❑ RUNNING MACTEST SE AND MACTEST SE/30

### Materials Required

*MacTest SE* or *MacTest SE/30* diagnostic disk (backup)  
Mini-DIN-8-to-mini-DIN-8 serial port cable  
SCSI loopback test card (modified with jumper—see  
"SCSI Loopback Jumper Procedure")  
Blank, 800K disk for drive test  
Blank, 1.4 MB disk for high-density drive test

### Starting MacTest SE and MacTest SE/30

You can use *MacTest SE* or *MacTest SE/30* to perform a functional test of the entire Macintosh SE or Macintosh SE/30 system (respectively), or you can use it to test a single component in a known-good system. Follow the start-up steps below for the testing you wish to perform.

### Testing Complete System or Logic Board

1. If you are testing a complete Macintosh SE or Macintosh SE/30 system, or if you intend to run the logic tests, turn the power off and remove any card installed in the expansion slot.
2. Install the loopback connectors as described under "Installing the Loopbacks," later in this section.
3. Insert the appropriate *MacTest* disk into the internal drive, and power on the system. *MacTest* will display the Start, or Status, window. From the Status window, you can click **Start** to run the tests.

### Testing Single Component

1. If you are testing a single component in a known-good system, insert the appropriate *MacTest* disk into the internal drive and switch on system power.
2. *MacTest SE* and *MacTest SE/30* will display a window telling you to switch off system power and connect the SCSI loopback cable. The SCSI loopback cable must be connected *only* when you are running the logic board tests. If you do not need to connect the SCSI loopback cable, click **OK** to get to the Status window.
3. From the Status window, you can use the *MacTest* menus. Go to the **Options** menu and use the **Test Selections** submenu to select the tests you want to run. Then click **Start**. For more specific information on the tests, see "Using the *MacTest SE* and *SE/30* Menus" and "Running the Tests," later in this section.

## Helpful Startup Information

1. If you do not know whether the system you are testing is good, remove any expansion cards and run the logic, drive, and video RAM (Macintosh SE/30 only) tests. (See "Using the *MacTest SE* and *SE/30* Menus" and "Running the Tests," later in this section.) Complete any needed repairs before you continue.
2. If you removed a non-Apple expansion card from the customer's system and the system tests OK, switch off system power and replace the card. Then run the logic, drive, and video RAM (Macintosh SE/30 only) tests again to be sure the card is not interfering with the system operation.
3. If you want to test an Apple PC Card or an Apple PC 5.25 Drive (Macintosh SE only), run the Apple PC 5.25 Drive test as described in Section 3, Diagnostics, of the *Apple PC 5.25 Drive Technical Procedures*.
4. If you encounter any of these problems, try the solution that follows each problem:
  - **A known-good *MacTest SE* or *MacTest SE/30* disk will not boot:** Refer to Section 5, Troubleshooting.
  - **The Configuration window indicates that an attached disk drive is not installed:** Check the disk drive cables.
  - **The Configuration window indicates that the wrong amount of RAM is installed:** Check SIMM placements in the SIMM banks. For a Macintosh SE, also check the position of resistors/jumpers on the logic board. Refer to Section 6, Additional Procedures.
  - **The Configuration window indicates that an upper internal drive is a lower internal drive (or vice versa):** Check the installation of the internal drive cables.
  - **A known-good *MacTest SE* or *MacTest SE/30* disk will not boot:** Refer to Section 5, Troubleshooting.

## Installing the Loopbacks

Before beginning *MacTest SE* or *MacTest SE/30*, and **with the power off**, connect the serial loopback cable, the SCSI loopback card, the keyboard and mouse, and the external drive (optional).

---

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

---

The SCSI loopback card (Figure 1, #1) must be connected to the SCSI port (Figure 1, #2) on the back of the system. (No other connections between the card and the Macintosh SE or Macintosh SE/30 are necessary.) To protect the SCSI circuitry, you must have the power off when you connect the SCSI card.

**Note:** When the SCSI loopback card is connected, the internal SCSI hard disk will not be able to respond, nor will it be recognized by the system.

The loopback cable (Figure 1, #3) with the mini DIN-8 connectors must be installed between the modem and printer ports (Figure 1, #4) on the rear of the machine.

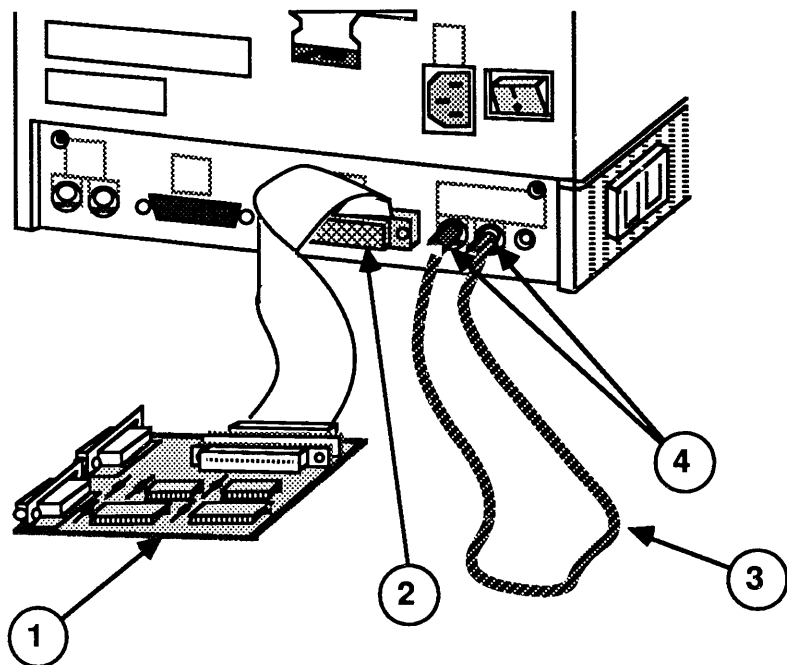


FIGURE 1

## Using the MacTest SE and SE/30 Menus

Before you start *MacTest SE* or *MacTest SE/30*, you may use the *MacTest* menus to select the tests that you want to run or to select other features of the diagnostic. **You cannot use the menus when the tests are running.**

### *Options Menu*

The **Options** menu contains the **Test Selections** and **Configuration** submenus.

1. **Test Selections:** The **Test Selections** windows displayed by *MacTest SE* (Figure 2) and *MacTest SE/30* (Figure 3) differ slightly, but the process of selecting tests is the same for both programs.

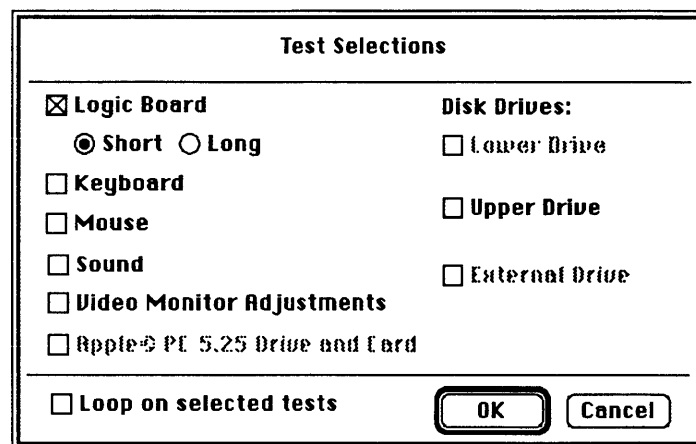


FIGURE 2

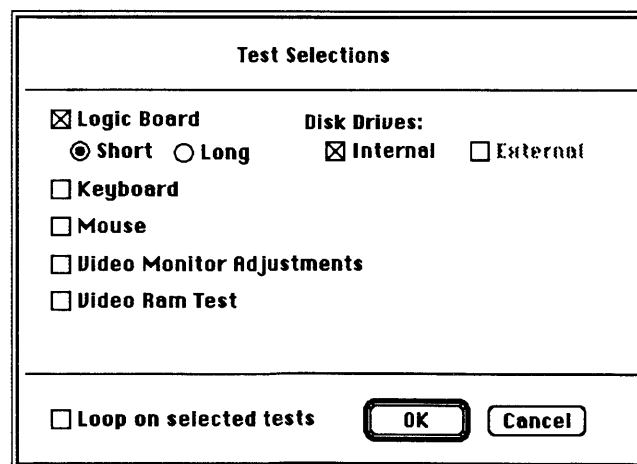


FIGURE 3

**Test Selections** allows you to select the tests you wish to run. To select a test, click in the box next to the name of the item to be tested (an **X** appears). To deselect the test, click again in the box (the **X** disappears). When you have selected all the tests you wish, click **OK** to return to the *MacTest* Status window.

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

- VIA (Versatile Interface Adaptor)
- SCC (Serial Communications Chip)
- Clock
- SCSI bus
- RAM
- FPU (Floating-Point Unit) (Macintosh SE/30 only)
- PMMU (Paged Memory Management Unit) (Macintosh SE/30 only)

You may select a short or long logic test. The running time of the test will vary depending on how much memory is installed. At the beginning of the RAM test, *MacTest SE* and *MacTest SE/30* will indicate the maximum running time of the test.

- b) **Keyboard:** This selection activates the keyboard self-tests that verify the functioning of the keyboard.
- c) **Mouse:** This selection activates the mouse self-tests that verify the functioning of the mouse.
- d) **Disk Drives:** You may test any or all of the drives (except internal or external hard disks):
- Lower
  - Upper (Macintosh SE only)
  - External

**Note:** The diagnostic will not test an external disk drive that is connected through a non-SCSI Hard Disk 20.

- e) **Video RAM (Macintosh SE/30 only):** This selection tests the 64K of video RAM. Be aware that video patterns will flash across your screen during this test.

- f) **Video Monitor Adjustments:** This selection displays test patterns that are used to adjust the video picture on the monitor. After making any necessary video adjustments, click the mouse or hit any key to continue testing or to return to the *MacTest SE* or *MacTest SE/30* window.
- g) **Sound:** This option provides two tests that verify the proper functioning of the Macintosh SE and Macintosh SE/30 sound chip:
- **8-Level Volume Test:** produces 8 tones of increasing volume.
  - **C Scale:** produces a C-major scale.
- h) **Apple PC 5.25 Drive (Macintosh SE only):** This test verifies the correct functioning of the drive, the Apple PC Card, and the expansion port on the main logic board. To set up for this test, follow the instructions in Section 3, Diagnostics, of the *Apple PC 5.25 Drive Technical Procedures*.
- Note:** The Apple PC 5.25 Drive test cannot always determine which module caused a test to fail. If the test reports that the drive and/or card is bad, replace one module at a time as described in Section 5, Troubleshooting, of the *Apple PC 5.25 Drive Technical Procedures*.
- i) **Loop on selected tests:** This selection provides a continuous running (in sequence) of all selected tests. To stop the looping, click **Stop** between tests (that is, when the screen displays an arrow rather than a wristwatch).

Here are a few simple guidelines to keep in mind when preparing to perform loop tests:

- You cannot loop on Video Monitor Adjustments.
- You cannot loop on *both* the Logic Board and Disk Drives tests at the same time.
- When loop-testing a disk drive with more than one possible data format (FDHD), you can select only one format to loop on.

2. **Configuration:** When **Configuration** is selected, *MacTest SE* displays the window shown in Figure 4, and *MacTest SE/30* displays the window shown in Figure 5.

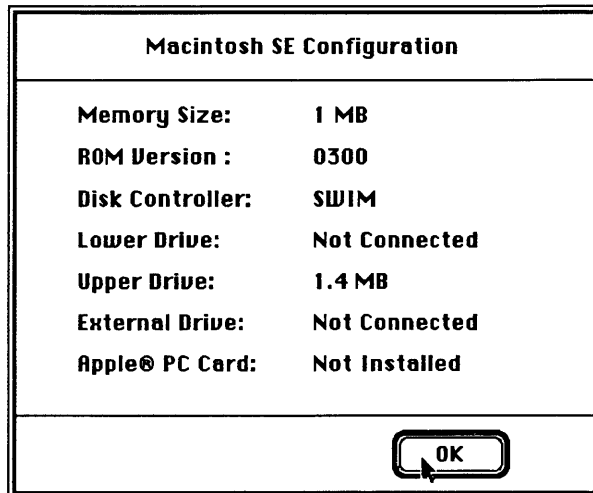


FIGURE 4

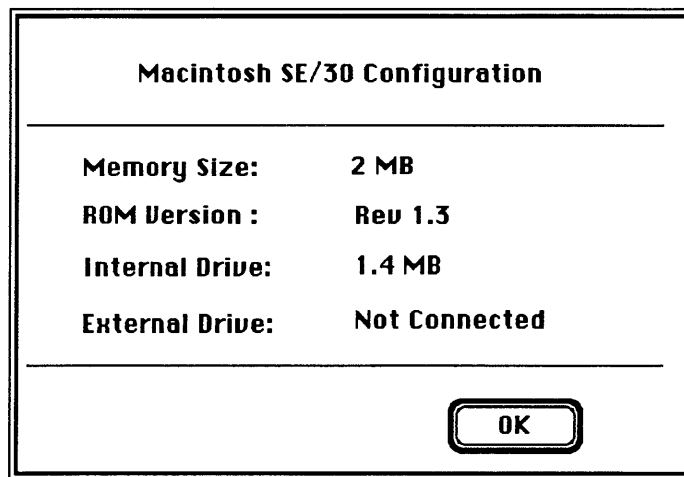


FIGURE 5

The two **Configuration** windows display slightly different information. The *MacTest SE* window indicates the amount of memory in the Macintosh SE, the version number of its ROMs, the type of disk controller chip installed, its current disk drive configuration, and whether or not an Apple PC card is installed. The *MacTest SE/30* window displays the amount of memory in the Macintosh SE/30, the version number of its ROMs, and its current disk drive configuration.

## File Menu

The **File** menu displays the following items. (**Open** and **Close** are dimmed.)

- **Open...** [Command-O]
  - **Close** (Dimmed unless a desk accessory is open)
  - **Save Test Selections** [Command-S]
  - **Stop** [Command-.]
  - **Quit** [Command-Q]
1. **Save Test Selections:** Allows you to customize your *MacTest* disk by saving your selection of tests for the next time you use *MacTest SE* or *MacTest SE/30*.
  2. **Stop:** Ends the diagnostic and returns to the *MacTest* Status window.
  3. **Quit:** Returns you to the desktop.

## Apple Menu

The Apple (🍏) menu contains the following items. (**Chooser** and **Find File** are shown, but they are inactive.)

1. **About MacTest™ SE or About MacTest™ SE/30.**  
When selected, a dialog box displays the diagnostic name, version number, date of release, serial number, and a copy-protect statement.
2. **Control Panel.** This option allows you to set preferences for speaker volume, monitor status, mouse tracking, or desktop pattern.
3. **Key Caps.** When selected, **Key Caps** displays a window with a keyboard. Press each key on the keyboard and verify that the display block for the key is highlighted. If the key is not highlighted, the keyswitch is bad and should be replaced. If numerous keys are not highlighted, exchange the keyboard.



## Running the Tests

After using **Test Selections** to select the tests you wish to run, you are ready to start *MacTest SE* or *MacTest SE/30*. Click **Start** in the Status window. Please note the following:

- The Status line at the bottom of the window will keep you informed of the tests being performed and the test results.
- While running, all tests display a wristwatch. There is no other moving or flashing indicator that tells you the test is in progress.
- When testing the logic board with a SCSI loopback card that is missing or improperly installed, testing will begin but the SCSI port test will fail. You must switch off system power, disconnect all external SCSI drives, and connect the SCSI loopback card before continuing the test.
- When testing the logic board, 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 connect a serial loopback cable and then to click **OK** to retry the failed test. (You can connect the serial loopback cable without shutting down the system.)
- The RAM test causes several seconds of startling graphics to be displayed on the screen before the program reboots to the *MacTest* Status window.

- When testing the FDHD disk drive, you will be prompted to insert and remove blank 800K and high-density (1.4 MB) disks. Perform the disk swaps as directed on the screen, and then click **OK**.

**Note:** It is important to insert the requested low- or high-density disk. If the wrong disk is inserted, *MacTest SE* and *MacTest SE/30* will indicate that the disk drive is malfunctioning when it may not be.

---

**CAUTION:** *Do not press the reset or interrupt switch while the RAM test is running. Pushing reset causes the RAM test to fail, and pressing interrupt may damage the MacTest disk.*

---

- You may halt the testing by clicking **Stop** or **Pause** anytime *between* tests (when the cursor is an arrow, rather than the wristwatch).
  - Choose **Stop** to halt the testing and to return to the Status window. 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.

**Note:** **Pause**, the default option, can also be selected **during** testing by pressing the <Enter> or <Return> keys. The program will act upon the Pause command when it is between tests.

Replace any module that the test indicates is faulty (see Section 2, Take-Apart). Before replacing the module, use *AppleCAT SE* or *AppleCAT SE/30* (whichever is appropriate) or refer to Section 5, Troubleshooting, to verify the diagnosis. If the system is still not operating properly, turn to Section 5, Troubleshooting, for more information.

If all tests pass, the Macintosh SE or Macintosh SE/30 will return to the Status window. The message **All selected tests have passed** will be displayed on the Status line.

---

## □ INTRODUCTION TO APPLECAT SE AND APPLECAT SE/30

*AppleCAT™ SE* and *AppleCAT™ SE/30* are diagnostic tools that use a known-good Macintosh to diagnose module failures in a defective Macintosh SE or Macintosh SE/30, respectively. The machine doing the testing, or test station, is connected to the machine being tested, or Unit Under Test (UUT), through their communication ports. The test station, when booted with the AppleCAT SE or AppleCAT SE/30 diagnostic program, performs the following functions:

- Establishes communications with the UUT
- Calls tests in the UUT ROM
- Downloads tests to the faulty machine
- Calls tests from the *MacTest SE* or *MacTest SE/30* disk in the UUT disk drive
- Displays test results on the test station screen
- Identifies the failing module
- Prompts the technician for information
- Recommends a repair procedure
- Issues a repair confirmation code (RCC)

Using *AppleCAT SE* or *AppleCAT SE/30*, the machine being tested does not have to be fully operational. By using an independent, working computer to do the diagnosis, the *AppleCAT* diagnostic programs depend very little on the unit under test (UUT), and are more reliable and thorough than traditional diagnostic methods.

Standard windows guide the technician through each stage of the diagnostic. When the UUT fails a test or indicates a problem, an *AppleCAT SE* or *AppleCAT SE/30* window will ask for more information or recommend a repair.

After each module replacement or adjustment, *AppleCAT SE* and *AppleCAT SE/30* rerun the failed test to verify that the problem has been fixed. If the UUT successfully completes this final test, the *AppleCAT* programs issue a repair confirmation code (RCC).

---

## □ RUNNING APPLECAT SE AND APPLECAT SE/30

### Materials Required

Known-good Macintosh test station  
Programmer's switch for the UUT  
Mini-DIN-8-to-mini-DIN-8 serial port cable (590-0552)  
SCSI loopback card  
Mini DIN-8 serial loopback plug  
Torx screwdriver  
Macintosh take-apart tool  
CRT discharge tool  
#0 Phillips screwdriver  
#1 Phillips screwdriver

### *Macintosh SE Materials Required*

Macintosh SE (unit under test or UUT)  
*AppleCAT™ SE* diagnostic disk  
*MacTest™ SE* disk (write-protected)  
Blank, 800K disk  
Blank, 1.4 megabyte disk

### *Macintosh SE/30 Materials Required*

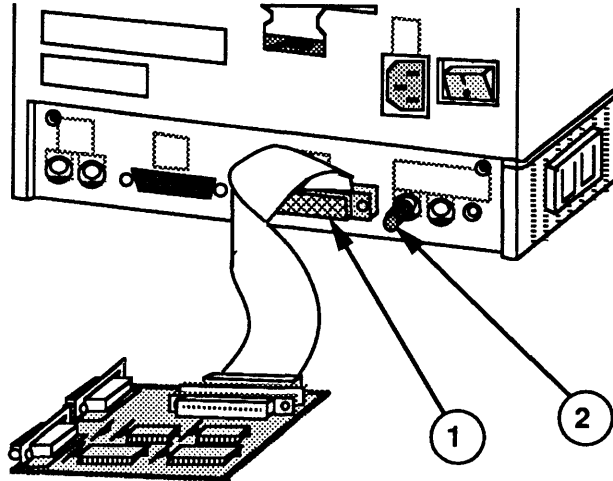
Macintosh SE/30 (unit under test or UUT)  
*AppleCAT SE/30* diagnostic disk  
*MacTest™ SE/30* disk (write-protected)  
Blank, 800K disk  
Blank, 1.4 megabyte disk

### Setting Up Test Station and UUT

1. Connect the test station to a wall socket with an AC power cord.
2. Place the UUT next to the test station.
3. Connect the UUT to a wall socket with an AC power cord.

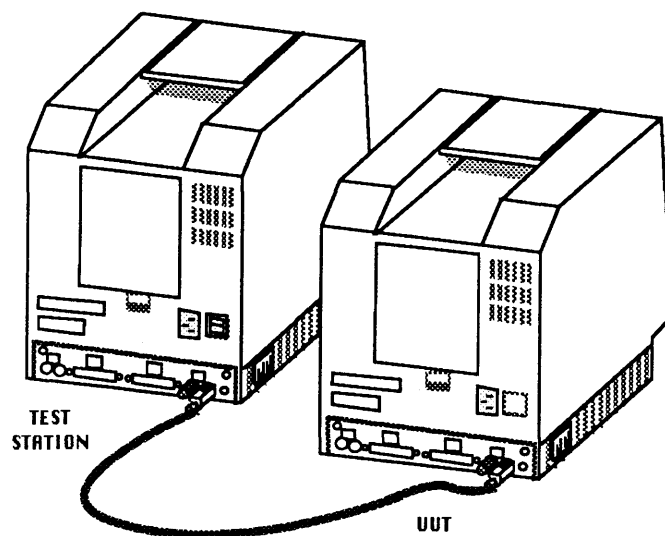
**CAUTION:** Always power off the system when you connect or disconnect the SCSI loopback card.

4. Connect the SCSI loopback card to the SCSI port (Figure 6, #1) on the UUT.
5. Connect the serial loopback plug to the printer port (Figure 6, #2) on the UUT.



**FIGURE 6**

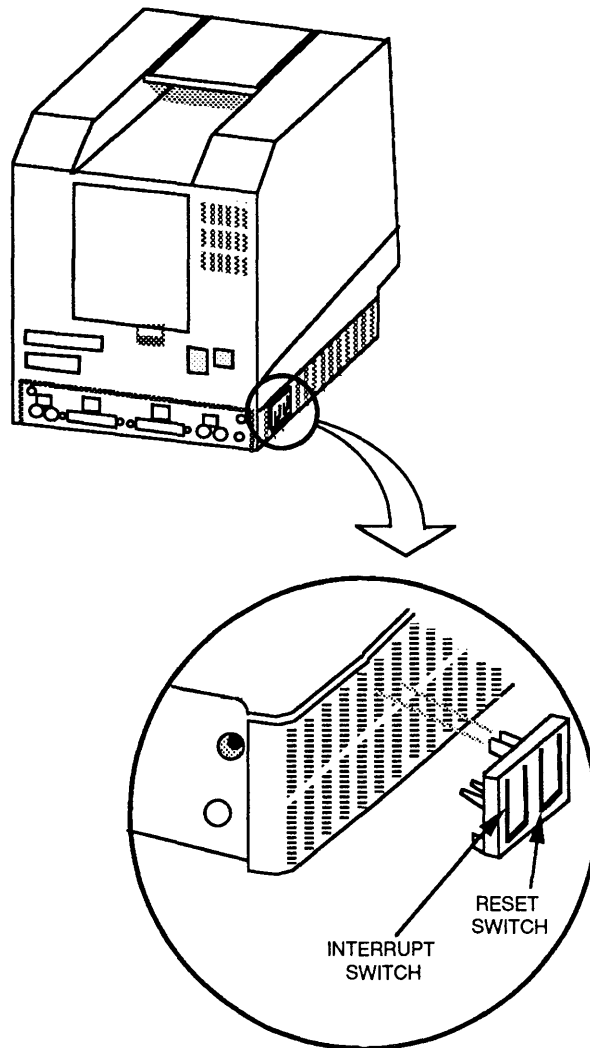
6. Connect one end of the serial port cable to the modem port on the UUT; connect the other end to the modem port on the test station (Figure 7).



**FIGURE 7**

7. Connect a keyboard or mouse to the UUT.
8. Verify that the programmer's switch (Figure 8) is installed. With the front of the UUT facing you, insert the two short tabs of the programmer's switch into the 6th and 7th **open** slots from the back, along the left side of the UUT. Push the switch until it snaps into place or you are certain it is secure.

The programmer's switch has two parts. The front part of the switch is a reset switch. Pressing the reset switch is just like turning the power switch **off** and back **on**. The back part of the switch is an interrupt switch. Pressing the interrupt switch places the UUT in interrupt mode.



**FIGURE 8**

## Establishing Communication

1. Insert the *AppleCAT SE* (if testing a Macintosh SE) or *AppleCAT SE/30* (if testing a Macintosh SE/30) disk in the test station, and switch on system power.
2. Open the disk icon and then the *AppleCAT* icon. The Start, or Status, window will appear on the test station screen.
3. Be sure that all disks are ejected from the UUT.
4. Switch on system power at the UUT.

For a Macintosh SE: If the video is normal, the Macintosh SE (UUT) will briefly display a blank gray screen with an arrow. When this screen appears, press the interrupt switch (Figure 9) to enter interrupt mode. (You may have to press the interrupt switch 3 to 5 times!) When in interrupt mode, the UUT can respond to information received over the communication port. You will know you are in interrupt mode when the screen displays the "sad Macintosh" icon.

If the UUT screen is completely dark, or if bars or stripes are displayed, there may be a problem with the video. If the above occurs, wait about 4 seconds per megabyte of installed memory, and then press the interrupt switch to enter interrupt mode.

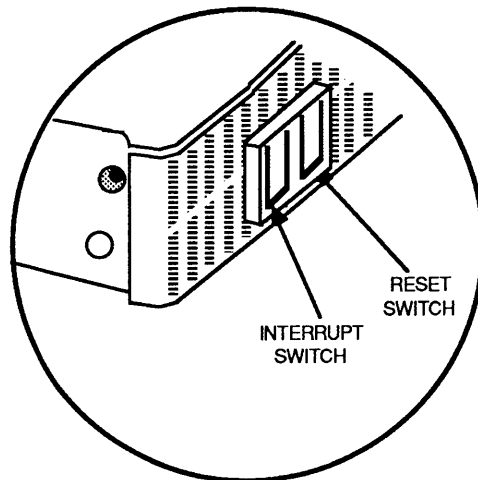


FIGURE 9

For a Macintosh SE/30: If you hear **only** the boot tone (a single chord), you are **not** in interrupt mode. To get into interrupt mode, wait until an arrow appears in the upper-left corner of the UUT (Macintosh SE/30) screen (about 4 seconds per megabyte of installed memory), and then press the interrupt switch (Figure 9). When in interrupt mode (test mode), the UUT can respond to information received over the communication port.

---

**IMPORTANT:** *If you hear any additional chords (chimes) after the single boot tone, you are already in interrupt/test mode. Do not hit the interrupt switch. The Macintosh SE/30 will automatically go into interrupt mode if an error is detected at power on.*

---

If the UUT has video problems, the arrow may not be visible in the upper-left corner of the screen. If there is no arrow, wait about 4 seconds per megabyte of installed memory, and then press the interrupt switch.

**Note:** If a *MacTest SE* or *MacTest SE/30* disk was left in the UUT disk drive during power on, the *MacTest* disk may boot before you can press the interrupt switch on the UUT. If this happens, eject the *MacTest* disk, power off the UUT, and start over at step 4.



## Using the AppleCAT Menus

Before you start *AppleCAT SE* or *AppleCAT SE/30*, you may use the *AppleCAT* menus to select the tests you want to run or to select other features of the diagnostic.

**Note:** You must make your test selections from the *AppleCAT* menus **before** starting *AppleCAT SE* or *AppleCAT SE/30*. Changes to the test selections cannot be made while the *AppleCAT* test is running. If you do not use the **Test Selections** menu, the default test selection will include the following tests:

- Logic Board
- Internal Disk Drive (Macintosh SE/30) or
- Lower Floppy Drive (Macintosh SE)

---

**IMPORTANT:** *Selecting specific tests shortens the AppleCAT SE/30 test, but selected tests cannot find all faulty modules. Only the default test selections will ensure a complete system check.*

---

## Options Menu

The **Options** menu contains the **Test Selections** submenu. **Test Selections** allows you to select and run certain tests individually. 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 **OK**. You will be returned to the Status window.

**Note:** Test Selections will remain unchanged until you change them or you reboot the *AppleCAT SE* or *AppleCAT SE/30* program.

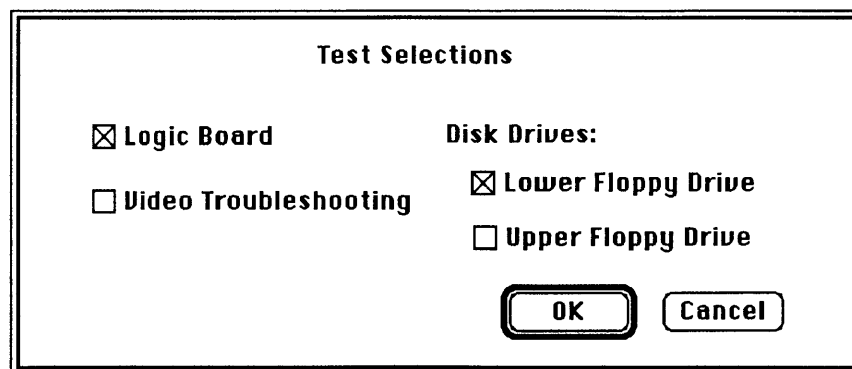
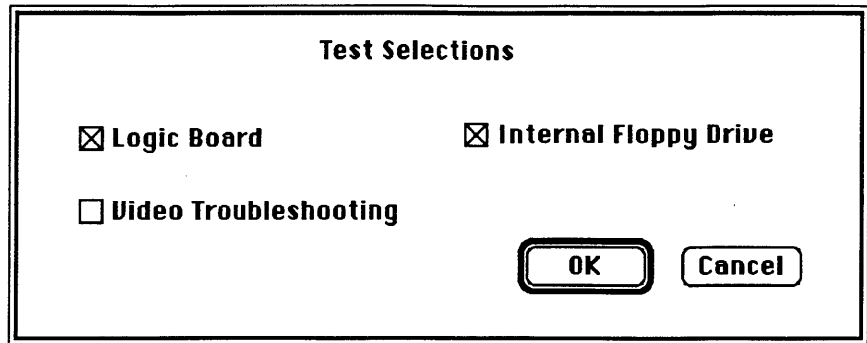


FIGURE 10



**FIGURE 11**

The **Test Selections** submenus for *AppleCAT SE* (Figure 10) and *AppleCAT SE/30* (Figure 11) differ slightly, but each program includes Logic Board, Video Troubleshooting, and Disk Drive tests.

1. **Logic Board:** This test verifies the correct functioning of the following circuitry on the Macintosh SE and Macintosh SE/30 logic boards:
  - ROM
  - Memory Size (RAM)
  - CPU Data Bus and Address Bus
  - Parameter RAM
  - VIA (Versatile Interface Adaptor)
  - Internal Clock
  - FPU (Floating Point Unit) (Macintosh SE/30 only)
  - Sound Chip (Macintosh SE/30 only)
  - SCC (Serial Communications Controller)
  - SCSI Bus
  - Apple Desktop Bus
  - Video RAM (Macintosh SE/30 only)

**Note:** Although both *AppleCAT* programs test the SCSI circuitry on the logic board, they do not test the internal SCSI hard disk. To test the hard disk, use the *Macintosh Hard Disk Drive Diagnostic* disk (see Section 3, Diagnostics, in the *SCSI Hard Disk Drives Technical Procedures*).

2. **Video Troubleshooting:** This test checks the video RAM. Be aware that video test patterns are flashed on the screen during the test—the patterns do not mean your monitor is failing.
3. **Internal Floppy Drives:** This test will verify the proper functioning of the SWIM/IWM disk controller chip, and the upper (Macintosh SE only) and lower floppy disk drives.

**Note:** Both the Macintosh SE and Macintosh SE/30 may have high-density disk drives installed. Testing a 1.4 MB internal drive requires swapping blank disks in the UUT. Refer to "Running the Tests," step 5, for more information.

#### *File Menu*

The **File** menu displays the following items. All are dimmed except **Stop** (during testing) and **Quit**.

- **Open...** [Command-O]
- **Close** (Dimmed unless a desk accessory is open)
- **Save Test Selections** (Option not available)
- **Stop** [Command-.]
- **Quit** [Command-Q]

1. **Stop:** Select **Stop** to end the diagnostic and return to the Status window.
2. **Quit:** Select **Quit** to exit the program and return to the desktop.

## Apple Menu

Both the *AppleCAT SE* and *AppleCAT SE/30* Apple (🍏) menus contain the following desk accessories:

1. **About Diagnostic:** When selected, a dialog box displays the diagnostic name, version number, date of release, serial number, and a copy-protect statement.
2. **Control Panel:** With this option you can set preferences for items such as speaker volume, mouse tracking, whether or not AppleTalk is connected, and the desktop pattern.

The following standard desk accessories are available either from the *AppleCAT SE* or from the *AppleCAT SE/30* Apple (🍏) menu:

- **Chooser** (*AppleCAT SE/30* only)
- **Find File** (*AppleCAT SE* only)
- **Scrapbook** (*AppleCAT SE* only)
- **Alarm clock** and **Calculator** (*AppleCAT SE* only)

## Help

The *AppleCAT SE/30* **Help** menu includes a **Memory Configuration** option. **Memory Configuration** shows all possible RAM SIMM configurations for your Macintosh SE/30.

The *AppleCAT SE* **Help** menu includes **SIMM Jumper Setup** and **SIMM Resistor Setup** options for the type of logic board in your Macintosh SE (see "Macintosh SE SIMM Upgrades" in Section 6, Additional Procedures). These selections show all possible RAM SIMM and corresponding jumper or resistor configurations for the Macintosh SE.

## Running the Tests

After selecting the tests you wish to run using **Test Selections**, you are ready to start *AppleCAT SE* or *AppleCAT SE/30*. Click **Start** in the *AppleCAT* Status window. Please note the following:

1. The Status line at the bottom of the Status window will keep you informed of the tests being performed and their results.

**Note:** If the message **Could not establish communication** appears on the Status line, you may have inserted the *MacTest* disk in the UUT disk drive before powering on. If this message appears, follow the instructions given in the *AppleCAT* Status window.

2. *AppleCAT SE* and *AppleCAT SE/30* will interact with you throughout each stage of the testing. When the UUT fails a test or indicates a problem, the program will prompt you for more information or recommend a repair.

**Note:** When performing disk drive tests on a Macintosh SE or Macintosh SE/30 with a 1.4 MB drive, you will be required to perform setup steps (see step 5).

3. The program will ask you for information that it cannot obtain electronically. The screen will display a choice of answers. Select the most appropriate answer in each situation. After selecting a response, click **OK** to continue.

---

**CAUTION:** *Do not click the OK button until you've completed every instruction given on the screen. Failure to complete the instructions may misdirect the diagnostic.*

---

4. If the UUT is turned off to replace or reinstall a module:
  - a) Verify that all cables and test fixtures are reattached before powering on.
  - b) Eject all disks from the UUT, and then switch on system power.
  - c) Macintosh SE: Wait 9 to 22 seconds, depending upon how much memory is installed, and press the interrupt switch to enter interrupt mode.

Macintosh SE/30: If you do not hear the test mode chimes, wait until an arrow appears onscreen (about 4 seconds per megabyte of RAM), and then press the interrupt switch to get into the test mode.

5. *AppleCAT SE* and *AppleCAT SE/30* will also ask you to perform setup steps. When the Setup Required window appears, insert the requested disk. After inserting the disk, click **Done** to continue the test. *AppleCAT* will request the following disks:

- 800K disk (blank and write-enabled)
- High-density disk (blank and write-enabled; for FDHD drive testing only)
- Write-protected, *MacTest SE/30* disk

6. You may halt the testing by clicking **Stop** or **Pause** anytime during the tests:
  - a) Choose **Stop** to halt the testing and to return to the *AppleCAT* Status window. Choose **Start** when you wish to begin the testing sequence again from the beginning.
  - b) Choose **Pause** if you wish to discontinue testing temporarily. Choose **Continue** to resume testing from the point of interruption.

---

**IMPORTANT:** Please read all messages and instructions carefully. Do only what the *AppleCAT* program specifically instructs you to do.

---

## Repair Confirmation Codes

If *AppleCAT SE* and *AppleCAT SE/30* find no problems, they return to the Status window. The Status line will display the message **All selected tests pass**.

If *AppleCAT SE* or *AppleCAT SE/30* detects an unidentifiable error in the Macintosh SE or Macintosh SE/30, it will issue a repair confirmation code (RCC). The RCC is an eight-digit information record that contains the diagnostic name, the diagnostic version number, the replaced module name, and the repair sequence the program followed. The RCC should be entered on the SRO form that accompanies the returned module.

## *AppleCAT* RCCs

If *AppleCAT SE* or *AppleCAT SE/30* is unable to identify the problem with the UUT, *AppleCAT* will issue an RCC beginning with one of the following four-digit prefixes:

- **19ZZ-xxxx** . . . . . for the Macintosh SE
- **4GZZ-xxxx** . . . . . for the Macintosh SE/30

## *Helpful* *Suggestions*

If you receive an RCC with one of the prefixes shown above, refer to Section 5, Troubleshooting, for information that can help you isolate the problem. Also keep in mind that *AppleCAT SE* and *AppleCAT SE/30* are unable to identify a system failure if any of the following is true:

- The bad module is failing intermittently.
- The system configuration changes during the test (memory is removed or added, or system power is removed).
- Selected modules are tested; only the default tests perform a complete system check.
- The replacement module itself is bad.
- You provide inaccurate input to *AppleCAT*, or set up the test station incorrectly.

## □ SCSI LOOPBACK JUMPER PROCEDURE

### To Determine If a Jumper Is Needed

To be used with *MacTest SE* and *AppleCAT SE*, and with *MacTest SE/30* and *AppleCAT SE/30*, 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, the card must be connected to a notched mouse cable. (For further information on the notched cable, refer to *Hard Disk 20SC Technical Procedures*, Section 5, "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 12, #1). **These new cards do not have to be jumpered.**

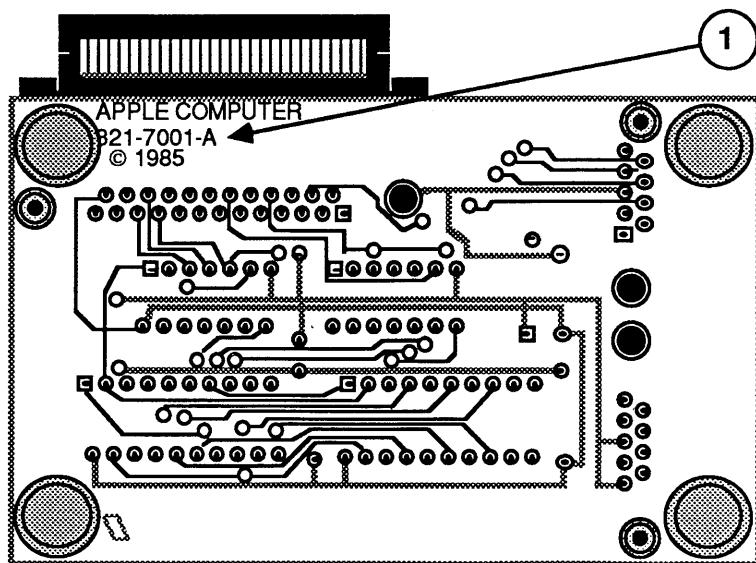
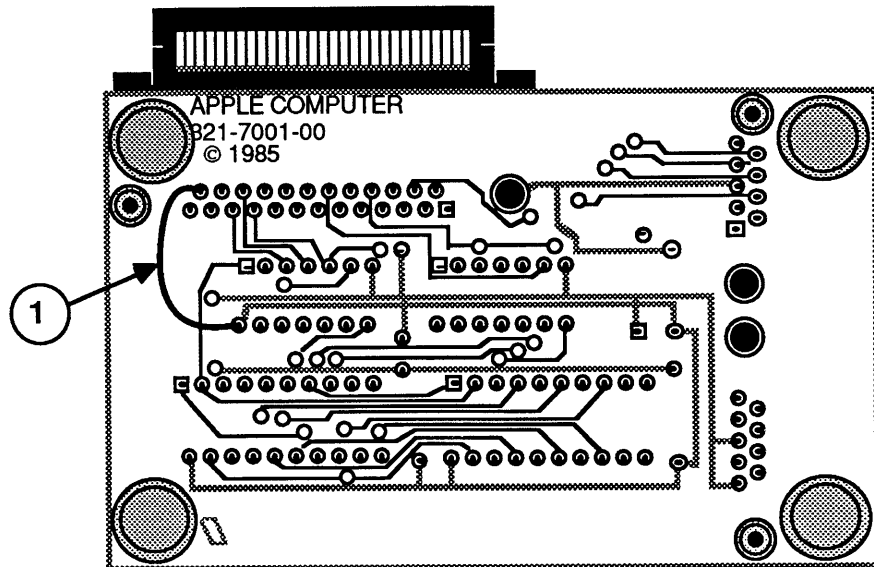


FIGURE 12



*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 13, #1). If the card has no external jumper, you must install one yourself.



**FIGURE 13**

*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 13. (The pins are not numbered on the board. In the orientation shown in Figure 13, 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 SE and Macintosh SE/30

## Section 5 – Troubleshooting

---

### □ CONTENTS

5.3	Introduction
5.3	General Information
5.3	How to Use the Symptom Chart
5.3	Things to Remember
5.4	Symptom Chart
5.4	Video Problems
5.6	Peripheral Problems
5.7	Drive Problems
5.8	SCSI Problems
5.9	Miscellaneous Problems
5.10	Isolating a Faulty Macintosh SE SIMM
5.12	Battery Verification
5.12	Introduction
5.12	Materials Required
5.12	Verification Procedure

(

(

(

## □ INTRODUCTION

### General Information

There are three diagnostic tests that you may use to troubleshoot a Macintosh SE or Macintosh SE/30 system:

- *AppleCAT™ SE or AppleCAT™ SE/30*
- *MacTest™ SE or MacTest™ SE/30*
- *Macintosh Hard Disk Drive Diagnostic* (version 4.0 or higher)

Use this troubleshooting section if the diagnostics are unable to detect a failure. Read "Symptom Chart," "Isolating a Faulty Macintosh SE SIMM," and "Battery Verification" before you begin troubleshooting; **you will need this information to troubleshoot the Macintosh SE and Macintosh SE/30 effectively.** After repairing the system, run the diagnostics to verify system operation.

### How to Use the Symptom Chart

Find the symptom that most nearly describes the problem, then perform the corrective actions in the order listed. If a corrective action does not fix the problem, go to the next action. **If you replace a module and find that the problem remains, reinstall the original module before you go on to the next action.**

### Things to Remember

1. Read all the safety precautions before removing or installing any modules. (See Section 1, Basics.)
2. Follow all ESD precautions when troubleshooting. (See *You Oughta Know* for more information.)
3. Perform the CRT discharge procedure before removing or installing any modules. (See Section 2, Take-Apart.)
4. Use known-good software. Bad software can produce symptoms that appear to be hardware problems.
5. If a non-Apple expansion card is installed, or if an Apple expansion card is installed and the Macintosh SE or Macintosh SE/30 will not start up, remove the expansion card before troubleshooting. When the Macintosh SE or Macintosh SE/30 operates correctly without the expansion card, replace the card and test again.

---

## ❑ SYMPTOM CHART

### Video Problems

### Solutions

- |   |   |
|---|---|
| • <i>Screen is dark; audio and drive operate</i>                                    | <ol style="list-style-type: none"><li>1. Turn brightness control clockwise.</li><li>2. Check video cable connections.</li><li>3. Replace analog board.</li><li>4. Replace video board.</li><li>5. Replace main logic board.</li><li>6. Replace CRT.</li></ol> |
| • <i>Screen is bright and audio is present, but no video information is visible</i> | <ol style="list-style-type: none"><li>1. Replace analog board.</li><li>2. Replace video board.</li><li>3. Replace main logic board.</li></ol>   |
| • <i>Screen is completely dark and fan is not running</i>                           | <ol style="list-style-type: none"><li>1. Replace power supply.</li><li>2. Replace analog board.</li></ol>   |
| • <i>A single vertical line is displayed</i>  | <ol style="list-style-type: none"><li>1. Replace analog board.</li><li>2. Replace video board.</li><li>3. Replace main logic board.</li><li>4. Replace CRT.</li></ol>   |
| • <i>A single horizontal line is displayed</i>                                      | <ol style="list-style-type: none"><li>1. Replace analog board.</li><li>2. Replace video board.</li><li>3. Replace main logic board.</li><li>4. Replace CRT.</li></ol>   |
| • <i>Vertical bars or stripes are displayed</i>                                     | <ol style="list-style-type: none"><li>1. Replace main logic board.</li><li>2. Replace analog board.</li></ol>   |
| • <i>Horizontal bars or stripes are displayed</i>                                   | <ol style="list-style-type: none"><li>1. Replace main logic board.</li><li>2. Replace analog board.</li></ol>   |

## Video Problems (Continued)

## Solutions

- *A white dot is displayed in center of screen*
  1. Verify that the yoke cable is connected.
  2. Replace analog board.
  3. Replace CRT.
  
- *Screen jitters at top left and/or lower right*
  - Replace analog board.

## 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 main logic board.
- *Cursor moves but clicking the mouse button has no effect*
  1. Replace mouse.
  2. Replace main logic board.
- *Cannot double-click to open an application, disk, or server*
  1. Remove any multiple system files on the hard disk.
  2. Clear parameter RAM. Hold down the <Shift><Option><Command> keys and select Control Panel from the Apple pull-down menu. Reset mouse controls.
  3. If mouse was connected to keyboard, connect it to a rear ADB port instead. If mouse works, keyboard should be replaced.
  4. If mouse does not work in any ADB port, replace mouse.
  5. Replace main logic board.
- *No response to any key on the keyboard*
  1. Check keyboard connection to ADB port.
  2. Replace keyboard cable.
  3. Replace keyboard.
  4. Replace main logic board.
- *Known-good ImageWriter, or ImageWriter II will not print*
  1. Make sure that the Chooser and the Control Panel are set correctly.
  2. Replace software with known-good.
  3. Replace printer interface cable.
  4. Replace logic board.
- *Known-good LaserWriter will not print*
  1. Make sure that the Chooser and the Control Panel are set correctly.
  2. Replace software with known-good.
  3. Refer to the *Networks* tab in the *Apple Technical Procedures*.

## Drive Problems

## Solutions

- *Audio and video are present, but one internal drive does not operate*
  1. Replace bad disk.
  2. Replace internal disk drive cable.
  3. Replace internal disk drive.
  4. Replace main logic board.
- *Audio and video are present, but neither internal drive operates (Macintosh SE only)*
  1. Replace bad disk.
  2. Replace main logic board.
- *External drive does not operate*
  1. Replace bad disk.
  2. Be sure the external drive is placed on the right side of the Macintosh SE or Macintosh SE/30.
  3. Replace external drive.
  4. Replace main logic board.
- *Disk ejects; display shows icon with blinking "X"*
  1. Replace disk with known-good system disk.
  2. Replace disk drive.
  3. Replace main logic board.
- *Unable to insert disk all the way*
  1. Insert opened paper clip into hole beside the drive.
  2. Power off system and hold mouse button down while powering on (to complete eject cycle).
  3. Replace disk drive.
- *Will not eject disk*
  1. Insert opened paper clip into hole beside the drive.
  2. Power off system and hold mouse button down while powering on.
  3. Replace disk drive.
- *Internal disk drive runs continuously*
  1. Replace bad disk.
  2. Replace disk drive.
  3. Replace main logic board.
  4. Replace disk drive cable.



## SCSI Problems

## Solutions

- *Internal or external hard disk will not operate*

1. Verify that SCSI loopback card is not attached.
2. Replace hard disk.
3. Replace main logic board.
4. Replace hard disk drive cable.

- *Works with internal or external SCSI device but will not work with both*

1. Verify SCSI device switch setting on the external device.
2. Replace terminator on the external device.
3. Verify terminator is installed on the internal SCSI drive.
4. Replace SCSI device select cable.

## Miscellaneous Problems

## Solutions

- *Clicking, chirping, or thumping sound*
  1. Verify analog board cable is connected at J12 on the logic board.
  2. Replace power supply.
  3. Replace analog board.
  4. Replace logic board.
  
- *Smoke/odor*
  1. Replace power supply.
  2. Replace analog board.
  
- *No video, no audio, and no drive operation*
  1. Connect power cord.
  2. Turn power on.
  3. Replace power cord.
  4. Replace power supply.
  5. Replace analog board.
  6. Replace main logic board.
  
- *"Sad Macintosh" icon*
  1. Replace bad diskette.
  2. Replace SIMM(s) if code matches any of those given in "Isolating a Faulty SIMM" chart.
  3. Verify that three-pin jumper on logic board is configured correctly for system RAM (Macintosh SE only). See "Macintosh SE SIMM Upgrades."
  4. Replace logic board.
  
- *"Sad Macintosh" icon and black vertical line are displayed; screeching sound*
  1. Verify that three-pin jumper on logic board is configured correctly for system RAM (Macintosh SE only). See "Macintosh SE SIMM Upgrades."
  2. Replace logic board.

---

## □ ISOLATING A FAULTY MACINTOSH SE SIMM

When the Macintosh SE is powered on, the ROM runs a series of logic board tests. Failure of any of these tests results in the display of a "Sad Macintosh" icon on the screen of the Macintosh SE (only). The icon is shown with two rows of eight-digit numbers that indicate the particular fault identified by the test.

Numbers representing SIMM faults in a Macintosh SE are grouped below by first-row codes. The paired XXs in the lower rows indicate the presence of any number other than 0 in **either or both** of the two positions. Identify the SIMM socket number for the type of logic board in your Macintosh SE, and replace the faulty SIMM.

---

**IMPORTANT:** *The Macintosh SE has both **solder-type** and **jumper-type** logic boards. To correctly locate the SIMM socket with the faulty SIMM, you first must identify the type of logic board in your Macintosh SE. Refer to Additional Procedures, "SIMM Upgrades."*

---

Code	Solder Type	Jumper Type
0000000E 000000XX	SIMM # 1	SIMM # 3
0000000E 00XX00XX	SIMM # 1	SIMM # 3
0000000E 0000XX00	SIMM # 2	SIMM # 4
0000000E XX00XX00	SIMM # 2	SIMM # 4
=====		
00000002 000000XX	SIMM # 1	SIMM # 3
00000002 00XX00XX	SIMM # 1	SIMM # 3
00000002 0000XX00	SIMM # 2	SIMM # 4
00000002 XX00XX00	SIMM # 2	SIMM # 4

Code	Solder Type	Jumper Type
00000003 000000XX	SIMM # 1	SIMM # 3
00000003 00XX00XX	SIMM # 1	SIMM # 3
00000003 0000XX00	SIMM # 2	SIMM # 4
00000003 XX00XX00	SIMM # 2	SIMM # 4
=====		
00000004 000000XX	SIMM # 3	SIMM # 1
00000004 00XX00XX	SIMM # 3	SIMM # 1
00000004 0000XX00	SIMM # 4	SIMM # 2
00000004 XX00XX00	SIMM # 4	SIMM # 2
=====		
00000005 000000XX	SIMM # 3	SIMM # 1
00000005 00XX00XX	SIMM # 3	SIMM # 1
00000005 0000XX00	SIMM # 4	SIMM # 2
00000005 XX00XX00	SIMM # 4	SIMM # 2

**Note:** With some SIMM faults, the "Sad Macintosh" display may not be entirely readable. In such cases, press the reset/interrupt switch. The code may flash very quickly before the machine attempts to reboot. An unreadable code often indicates a fault with the SIMM at position 3 or 4; so if you cannot find a way to read the code, try replacing these two SIMMs, one at a time.

---

## ❑ BATTERY VERIFICATION

### Introduction

The Macintosh SE and Macintosh SE/30 logic boards each have a long-life lithium battery. Use the following procedure to check battery operation. If the battery falls below specifications, it must be replaced. Refer to Additional Procedures for replacement information.

---

***WARNING:*** *Lithium batteries, the type used in the Macintosh SE and Macintosh SE/30, have some potential for explosion if improperly handled. Follow the procedure below exactly as written.*

---

### Materials Required

Voltmeter

### Verification Procedure

To check the lithium battery with a voltmeter:

1. Be sure the power is off. Then remove the logic board from the Macintosh SE or Macintosh SE/30.
2. Locate the lithium battery. Figure 1, #1 shows the location of the battery on a Macintosh SE logic board; Figure 2, #1 shows the battery location on a Macintosh SE/30 logic board.

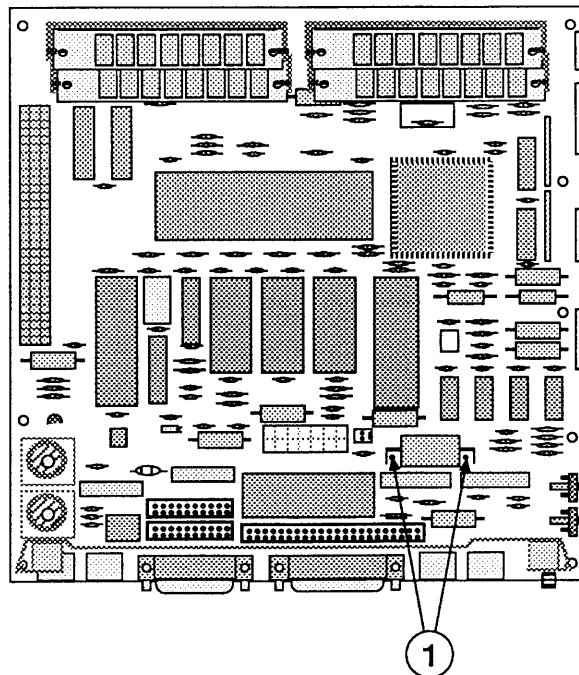


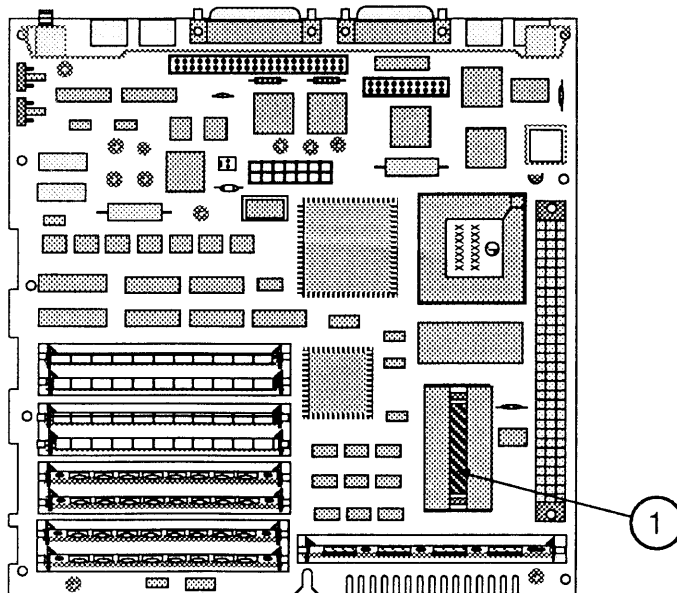
FIGURE 1

3. Set the voltmeter range to measure 10 volts DC.

**Note:** The battery in the Macintosh SE/30, and in all Macintosh SEs sold after August 1989, is installed in a plastic battery holder. It may be necessary to remove the battery holder cover (Macintosh SE/30 only) (Figure 2, #1) and pull out the battery by hand to measure battery voltage.

4. Touch and hold the positive probe of the voltmeter to the positive side of the battery. The positive side of the battery is marked "+" on the logic board.
5. Touch and hold the ground probe of the voltmeter to the negative side of the battery.
6. The reading for a good battery should be above 2.8 volts.

If the battery voltage is below 2.8 volts, replace the battery. To replace the Macintosh SE battery, refer to Section 6, Additional Procedures.



**FIGURE 2**

(

(

(

# Macintosh SE and Macintosh SE/30

## Section 6 – Additional Procedures

---

### □ CONTENTS

6.3	Battery Replacement
6.3	Introduction
6.4	Battery Identification
6.5	Replacing Soldered Batteries (SE only)
6.7	Replacing Batteries in Battery Holders
6.8	SIMM Identification
6.8	Speed
6.8	1 MB SIMMs
6.9	256K SIMMs
6.10	Macintosh SE SIMM Upgrades
6.10	RAM Configurations
6.11	SIMM Arrangements
6.12	Logic Board Identification
6.14	Solder-Type Logic Board
6.15	Solder-Type Upgrades
6.17	Jumper-Type Logic Board
6.18	Jumper-Type Upgrades
6.20	Macintosh SE/30 SIMM Upgrades
6.20	RAM Configurations
6.20	SIMM Arrangements
6.21	SIMM Upgrades
6.24	Macintosh SE Chassis Tab Modification
6.24	Introduction
6.24	Modification Procedure
6.25	Chassis Assembly
6.25	Introduction
6.25	Assembly Procedure
6.26	Macintosh SE/30 Logic Board Upgrade
6.26	Introduction
6.26	Installation
6.29	FDHD Upgrade for the Macintosh SE
6.29	Introduction
6.29	Materials Required
6.29	Upgrade Procedure



(

(

(

---

## □ BATTERY REPLACEMENT

### Introduction

Lithium thionyl chloride batteries, the type used in the Macintosh SE and Macintosh SE/30, have some potential for explosion if improperly handled. The following precautions should be taken when storing, handling, or disposing of lithium batteries.

- Lithium batteries should be stored in a designated, well-marked area with limited access.
- Apple's lithium batteries are sealed in individual zip-lock wrappers. Upon receipt, the batteries should be inspected for integrity of their wrappers, and should be stored in the same packaging in which they were received.
- Lithium batteries cannot be recharged. Do not attempt to recharge the battery. Doing so may cause the battery to overheat or explode.
- Do not allow the leads or terminals to short-circuit. A short-circuited battery may overheat or explode.
- Replace the battery with the correct Apple replacement battery only. Using an incorrect battery or a non-Apple battery may cause the battery to overheat or explode.
- When installing the battery, ensure the correct polarity. The polarity markings on the battery must match those on the battery holder or circuit board. Failure to observe correct polarity may cause the battery to overheat or explode.
- If the battery holder was provided with a cover, be sure to replace the cover.
- If the dead battery has leads, remove them before disposing of the battery.
- Do not dispose of the battery in a fire or incinerator. Doing so may cause the battery to explode.
- In addition to its explosive potential, lithium is water reactive and must be disposed of as a hazardous waste, as follows:

After removing a "dead" battery from the board, clip off its lead wires (necessary only for batteries that have been unsoldered from a Macintosh SE logic board), and place the battery into the zip-lock wrapper and 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. **Exception:** If the battery is physically damaged (for example, it's leaking), do not return it to Apple; dispose of the battery locally according to your local ordinances.

The long-life lithium battery in the Macintosh SE and Macintosh SE/30 should serve many years. Refer to Section 5, Troubleshooting, to check the condition of the battery. If the battery should fail for some reason, replace it according to the following procedure.

#### **Battery Identification**

The Macintosh SE and Macintosh SE/30 contain a single long-life lithium battery. In the Macintosh SE, this battery is either soldered to the logic board or installed in a plastic battery holder. In the Macintosh SE/30, the battery is always installed in a battery holder.

If a soldered battery fails, replace it using the "Replacing Soldered Batteries (SE only)" procedure. Replace all other batteries using the "Replacing Batteries in Battery Holders" procedure.

#### **Materials Required**

Grounded workbench and wriststrap

---

**CAUTION:** Use ESD precautions before removing or replacing the battery. Failure to do so may result in logic board failure.

---

## Replacing Soldered Batteries (SE only)

To replace a bad battery that has been soldered to a Macintosh SE logic board:

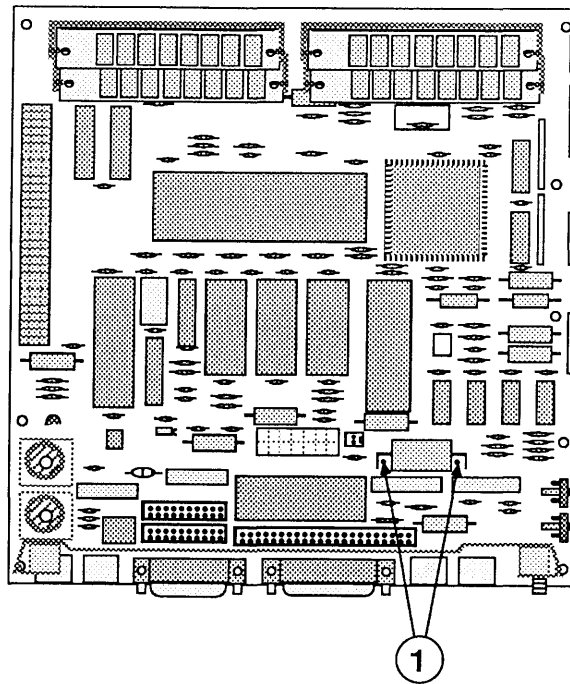
1. Remove the cover and discharge the CRT.

---

***WARNING:*** *Never put on your grounding wriststrap until after the CRT has been discharged.*

---

2. Move the Macintosh SE onto a soft, grounded workbench pad and put on your grounding wriststrap.
3. Remove the main logic board and place it on the grounded workbench pad.



**FIGURE 1**

4. Using wire clippers, cut the leads (Figure 1, #1) at both ends of the battery to free it from the main logic board. Cut the leads as close to the logic board as you can without touching the board with the clippers.

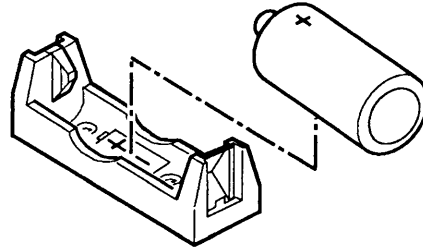


FIGURE 2

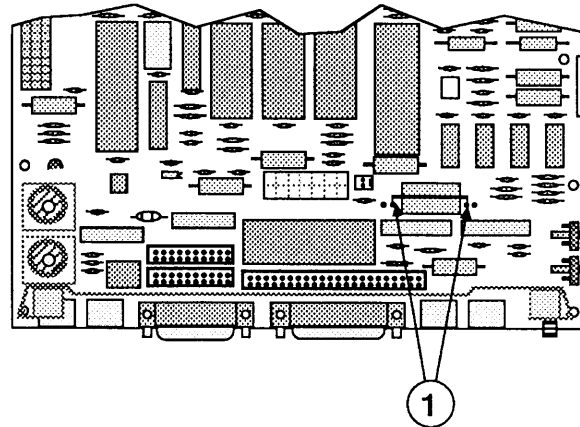


FIGURE 3

5. Orient the new battery so that the end marked "+" matches the "+" on the main logic board (Figure 2). Insert the battery leads into the extra set of mounting holes (Figure 3, #1) on the logic board (just inside the original mounting holes). Make sure the leads go all the way through the logic board to the other side.
  6. Holding the battery in place, turn the logic board over and touch a soldering iron to the two new battery leads protruding through the inner mounting holes.
- Note:** It is not necessary to desolder the remains of the old leads from the outer mounting holes.
7. Replace the main logic board and the cover.
  8. Trim the leads of the old battery, package and label it as directed in the introduction to this procedure, and return the battery to Apple for proper disposal.

## Replacing Batteries in Battery Holders

To replace a bad battery that has been installed in a plastic battery holder on either a Macintosh SE or Macintosh SE/30 logic board:

1. Remove the cover and discharge the CRT.

---

***WARNING:*** *Never put on your grounding wriststrap until after the CRT has been discharged.*

---

2. Move the computer onto a soft, grounded workbench pad and put on your grounding wriststrap.
3. Remove the main logic board and place it on the grounded workbench pad.
4. Remove the plastic cover (Macintosh SE/30 only) (Figure 4, #1) and pull the battery out of the battery holder (Figure 4, #2).
5. Orient the new battery so that the end marked "+" matches the "+" on the main logic board (Figure 2). Insert the battery in the battery holder (Figure 4, #2) and (if necessary) replace the plastic cover (Figure 4, #1).
6. Replace the main logic board and the cover.
7. Package and label the old battery as directed in the introduction to this procedure, and return the battery to Apple for proper disposal.

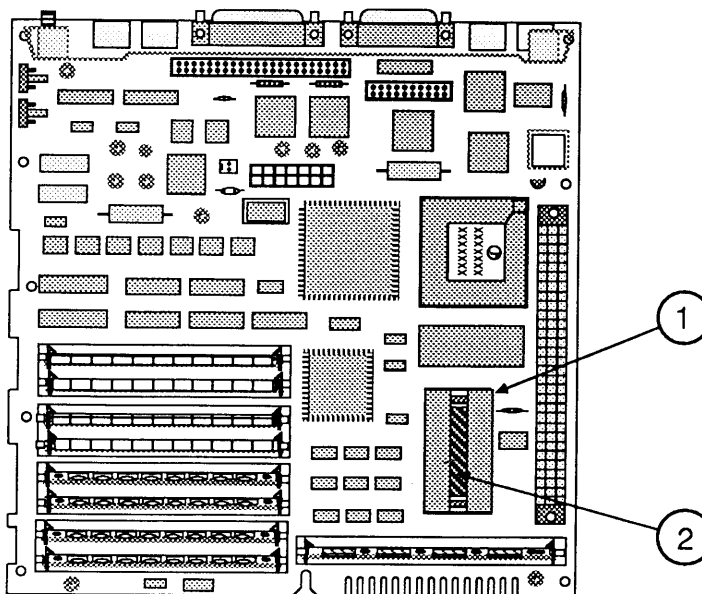


FIGURE 4

## ❑ SIMM IDENTIFICATION

Single In-line Memory Modules (SIMMs) for the Macintosh SE and Macintosh SE/30 are available with two sizes of RAM—256K and 1 MB—and come in several configurations that can be used interchangeably.

---

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

---

### Speed

**You must use 150 ns (or faster) SIMMs on the Macintosh SE and 120 ns (or faster) SIMMs on the Macintosh SE/30.** SIMMs with a slower rating than those specified will cause serious timing problems. The RAM speed is usually indicated by the -xx number after the manufacturer's part number. For example, -15 indicates 150 ns SIMMs and -12 indicates 120 ns SIMMs.

### 1 MB SIMMs

The 1 MB SIMMs come in two configurations:

- 1 MB SOJ SIMM (Figure 5, #1)  
The 1 MB SOJ (Single Out-line J-Lead) SIMM contains eight surface-mounted ICs. Each IC has ten pins (or legs) on each of two sides.
- 1 MB DIP SIMM (Figure 5, #2)  
The 1 MB DIP (Dual In-line Package) SIMM contains eight ICs mounted through the printed circuit board. Each IC has nine pins (or legs) on each of two sides.

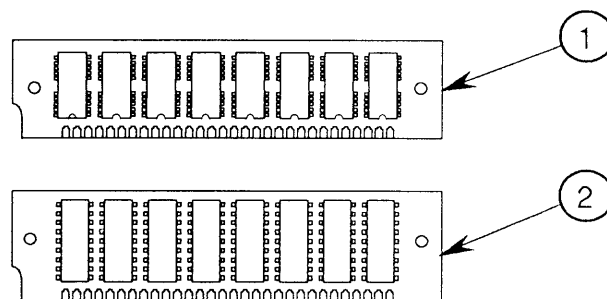


FIGURE 5

## 256K SIMMs

The 256K SIMMs come in several configurations:

- 256K SOJ SIMM (Figure 6, #1)  
The 256K SOJ (Single Out-line J-Lead) SIMM contains two surface-mounted ICs. Each IC has ten pins (or legs) on each of two sides.
- 256K DIP SIMM (Figure 6, #2)  
The 256K DIP (Dual In-line Package) SIMM contains two ICs mounted through the printed circuit board. Each IC has ten pins (or legs) on each of two sides.
- 256K PLCC SIMM (Figure 6, #3)  
The 256K PLCC (Plastic Leaded Chip Carrier) SIMM contains eight surface-mounted ICs. Each IC has five pins (or legs) on each of two sides and four pins on each of the other two sides.
- 256K DIP SIMM (Figure 6, #4)  
This DIP SIMM contains eight ICs. Each IC has eight pins on each of two sides.

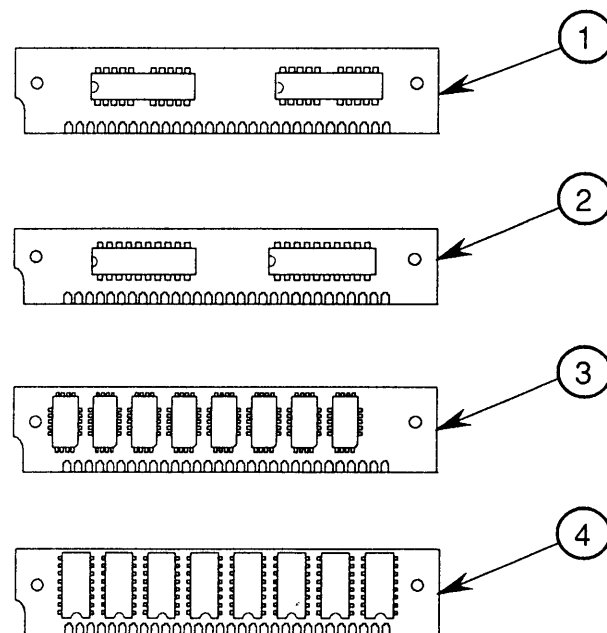


FIGURE 6



---

## □ MACINTOSH SE SIMM UPGRADES

RAM memory for the Macintosh SE and Macintosh SE/30 is installed on Single In-line Memory Modules (SIMMs). When performing SIMM upgrades, keep in mind that the Macintosh SE and Macintosh SE/30 contain completely different CPUs, and the upgrade procedures are different. If you are upgrading a Macintosh SE/30, refer to "Macintosh SE/30 SIMM Upgrades" later in this section. Steps for upgrading a Macintosh SE follow.

---

**IMPORTANT:** *When performing SIMM upgrades, it is important to remember that there are two configurations of the Macintosh SE logic board, and that the upgrade procedure is different for each configuration. See "Logic Board Identification" for more information.*

---

**Note:** When removing SIMMs from the logic board, use the SIMM removal tool. Instructions are in *You Oughta Know*.

### RAM Configurations

The Macintosh SE can be configured with 1 MB, 2 MB, 2.5 MB, or 4 MB of RAM installed on the logic board. Because there are two different versions of the Macintosh SE logic board, and several configurations of the 256K and 1 MB SIMMs, system expansion must follow strict guidelines. The memory upgrade guidelines that follow will enable you to identify and modify your version of the Macintosh SE logic board and install SIMMs correctly on the board.

## SIMM Arrangements

The Macintosh SE logic board has four SIMM sockets (Figure 7, #1), labeled 1, 2, 3, and 4. These sockets are arranged in two rows: SIMM 1 and SIMM 2 are paired together in one row, and SIMM 3 and SIMM 4 together form the other row. Rows can have either two 256K SIMMS or two 1M SIMMS installed.

**Note: The oversized 256K and 1M DIP SIMMs should be installed in SIMM sockets 3 and 4 only.** DIP SIMMs installed in SIMM sockets 1 and 2 may interfere with the installation of cards in the expansion connector (Figure 7, #2).

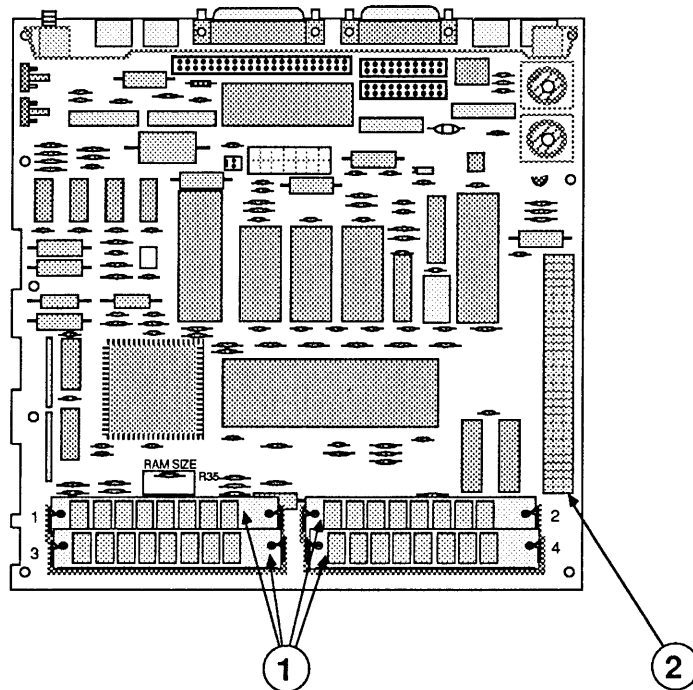


FIGURE 7

## Logic Board Identification

Because the upgrade procedure is different for the solder-type and jumper-type versions of the Macintosh SE logic board, you must first identify the type of logic board you are upgrading:

1. **Solder-type logic board**—Locate the area on the logic board identified by Figure 8, #1. On one version of the Macintosh SE logic board the area is labeled "RAM SIZE," and may have a R35 or R36 resistor (Figure 8, #2) soldered to the logic board. Refer to "Macintosh SE Solder-Type Logic Boards" for more information.

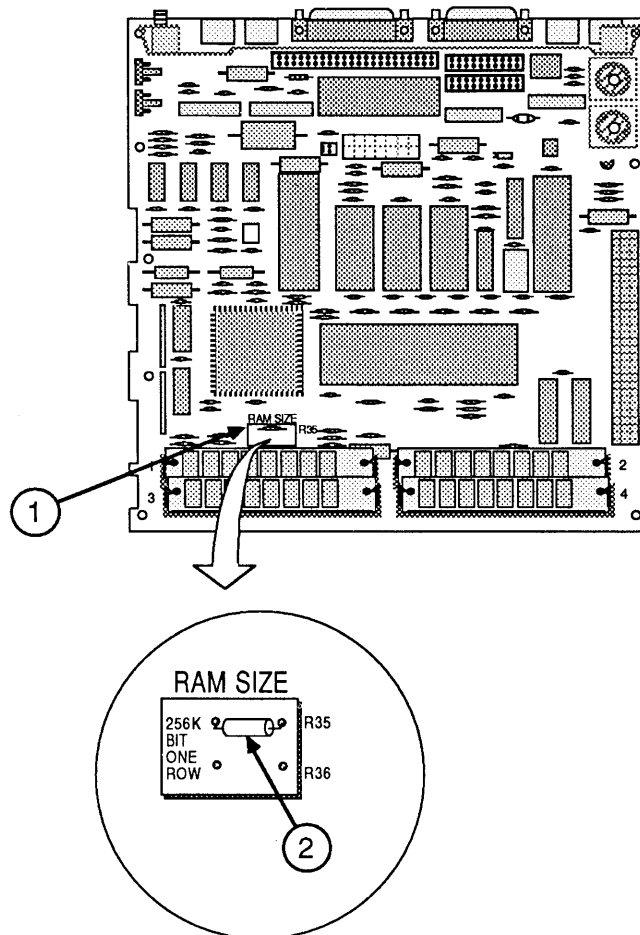


FIGURE 8

2. **Jumper-type logic board**—The other version of the Macintosh SE logic board has a three-pin jumper block at the area on the logic board identified by Figure 9, #1. The jumper block is labelled "2/4M 1M" on the logic board. Refer to "Jumper-Type Logic Boards" for more information on this version of the Macintosh SE logic board.

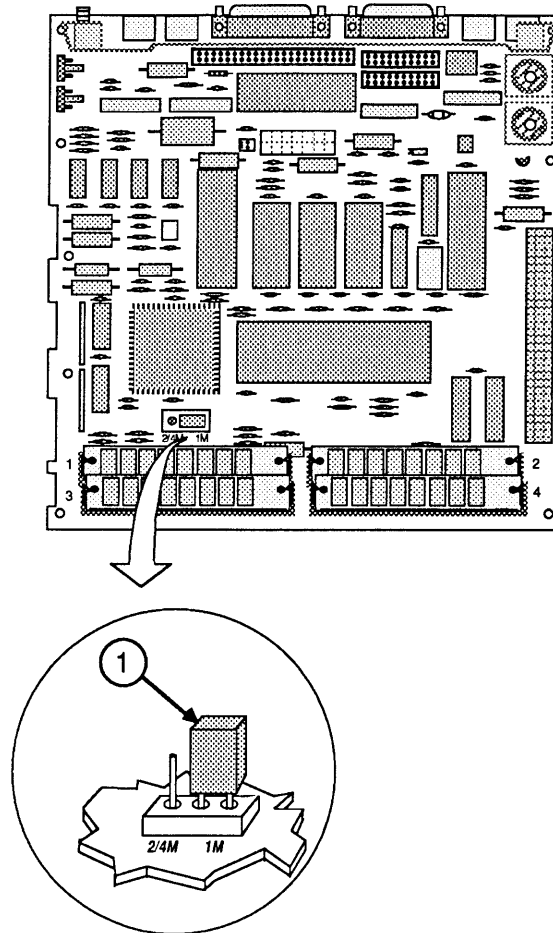


FIGURE 9

## **Solder-Type Logic Board**

Upgrading the system RAM may require making changes to the logic board. Locate the area of the logic board labeled RAM SIZE. The location of two resistors in this area, or the absence of these resistors, tells the Macintosh SE important information about what kind of SIMMs and how many are installed on the logic board.

### ***1-Megabyte Configuration***

The standard 1-megabyte RAM configuration consists of four 256K SIMMs installed in both rows on the Macintosh SE logic board. The presence of resistor R35 (marked "256K BIT")—soldered to the logic board as shown in Figure 10, #1—tells your computer that 256K SIMMs are installed in both rows on the logic board. You will need to cut or remove resistor R35 to upgrade computer RAM; computers configured with 1 MB of RAM can be upgraded to 2.5 MB and 4 MB.

### ***2-Megabyte Configuration***

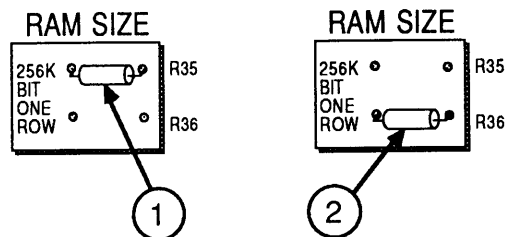
The standard 2 MB configuration has two 1 MB SIMMs installed in the first row (SIMM sockets 1 and 2) on the logic board. The presence of resistor R36 (marked "ONE ROW")—soldered to the logic board as shown in Figure 10, #2—tells your computer that only one row of 1 MB SIMMs is installed on the logic board. If you are adding a second row of SIMMs to the logic board, resistor R36 must be cut or removed.

### ***— 2.5-Megabyte Configuration***

A Macintosh SE can be configured with 2.5 MB of RAM by installing two 1 MB SIMMs in the first row (SIMM sockets 1 and 2), and two 256K SIMMs in the second row (SIMM sockets 3 and 4) on the logic board. Both the R35 and R36 resistors must be cut or removed to upgrade a Macintosh SE to 2.5 MB of RAM.

### ***4-Megabyte Configuration***

A Macintosh SE can be configured with 4 MB of RAM by installing a 1 MB SIMM in each of the four SIMM sockets on the logic board. The R35 and R36 resistors must be cut or removed to upgrade to 4 MB.



**FIGURE 10**

## Solder-Type Upgrades

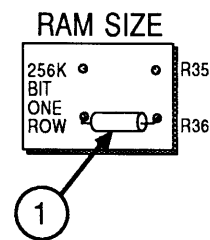
Follow the procedure below to expand a 1-megabyte Macintosh SE (with the solder-type logic board) to 2.5 or 4 megabytes, or to expand the 2 MB configuration to 2.5 or 4 megabytes. (For detailed take-apart, CRT discharge, and module installation instructions, see Section 2, Take-Apart.)

1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE onto a soft, grounded workbench pad, and put on your grounding wriststrap. (Never put on a grounding wriststrap until after the CRT has been discharged.)
3. Remove the main logic board and place it on the grounded workbench pad.
4. If you are adding memory to a computer with 1 megabyte of RAM, perform the following steps:
  - a) Locate resistor R35, marked "256K BIT" (Figure 10, #1). Using small diagonal cutters, clip the resistor off the board and discard it. (You do not need to desolder the leads from the board.)
  - b) Perform the steps that follow for the upgrade you are making:

**Note:** When removing SIMMs, use the SIMM removal tool. See *You Oughta Know* for SIMM tool instructions.

**To 2.5 megabytes:** Remove the two 256K SIMMS from positions 1 and 2, and install two 1 MB SIMMs in those positions. Leave the two 256K SIMMs in positions 3 and 4. Place the removed 256K SIMMs in an antistatic bag, and return them to the customer.

**To 4 megabytes:** Remove the four 256K SIMMS, and install four 1 MB SIMMs. Place the removed 256K SIMMs in an antistatic bag, and return them to the customer.



**FIGURE 11**

5. If you are upgrading a 2-megabyte computer, perform the following steps:
  - a) Locate resistor R36, marked "ONE ROW" (Figure 11, #1). Using small diagonal cutters, clip the resistor off the board and discard it. (You do not need to desolder the leads from the board.)
  - b) Perform the steps that follow for the upgrade you are making:

**To 2.5 megabytes:** Add two 256K SIMMS to positions 3 and 4.

**To 4 megabytes:** Add two 1 MB SIMMs to positions 3 and 4.

6. Replace the main logic board, and replace the cover.

## Jumper-Type Logic Board

Changes to the logic board must be made for some RAM configurations. Locate the three-pin jumper block on the logic board (Figure 12). The presence or position of a jumper between terminals on the jumper block tells the Macintosh what kind of SIMMs, and how many rows of SIMMS, are installed on the logic board.

### *1-Megabyte Configuration*

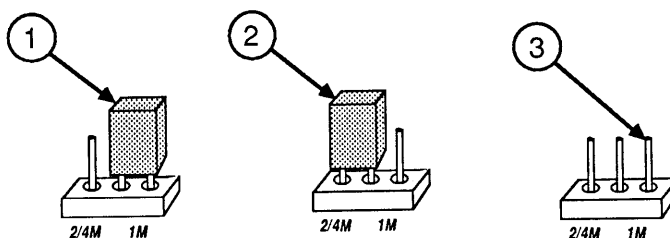
The standard 1-megabyte RAM configuration consists of four 256K SIMMs installed in both rows on the Macintosh SE logic board. The jumper that is installed on the jumper block terminals labeled "1M" (Figure 12, #1) tells the Macintosh that you have 1 MB of RAM installed on the logic board. You will need to remove this jumper to upgrade computer RAM; computers configured with 1 MB of RAM can be upgraded to 2.5 MB and 4 MB.

### *2-Megabyte Configuration*

The standard 2 MB configuration has two 1 MB SIMMs installed in the second row (SIMM sockets 3 and 4) on the logic board. The jumper that is installed on the jumper block terminals labeled "2/4M" (Figure 12, #2) tells the Macintosh SE that you have 2 MB of RAM installed on the logic board. If you are adding a second row of SIMMS to the logic board, you must remove this jumper.

### *2.5-Megabyte Configuration*

A Macintosh SE configured with 2.5 MB of RAM has two 1 MB SIMMs installed in the second row (SIMM sockets 3 and 4), and two 256K SIMMs installed in the first row (SIMM sockets 1 and 2) on the logic board. The jumper must be completely removed to upgrade a Macintosh SE to 2.5 MB (Figure 12, #3).



**FIGURE 12**



## 4-Megabyte Configuration

A Macintosh SE configured with 4 MB of RAM has a 1 MB SIMM installed in each of the four SIMM sockets on the logic board. Again, the jumper must be completely removed (Figure 13, #1).

## Jumper-Type Upgrades

Follow the procedure below to expand a 1 MB Macintosh SE (with the jumper-type logic board) to 2.5 or 4 megabytes, or to expand the 2 MB configuration to 2.5 or 4 megabytes. (For detailed take-apart, CRT discharge, and module installation instructions, see Section 2, Take-Apart.)

## Materials Required

Needlenose pliers

## Upgrade Procedure

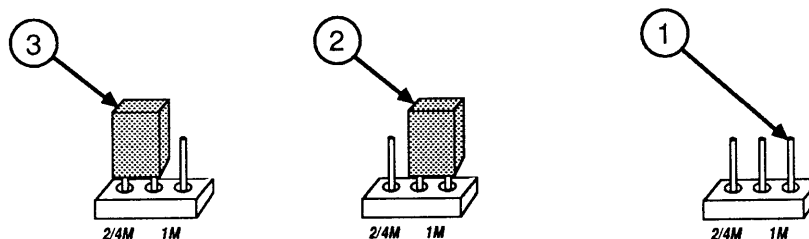
1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE onto a soft, grounded workbench pad and put on your grounding wriststrap. (Never do this until after discharging the CRT.)
3. Remove the main logic board and place it on the grounded workbench pad.

---

**IMPORTANT:** *The Macintosh SE will not recognize that it has been upgraded to 2.5 or 4 megabytes unless the jumper is removed in step 4 or 5. When upgrading to 2.5 or 4 megabytes, be sure to completely remove the logic board jumper. Also note that the AppleCAT SE diagnostic cannot detect this configuration problem.*

---

4. If you are adding memory to a Macintosh SE with 1 megabyte of RAM, perform the following steps:
  - a) Locate the jumper (Figure 13, #2). Using pliers, completely remove the jumper from the three-pin jumper block.



**FIGURE 13**

- b) Perform the steps that follow for your upgrade:

**Note:** When removing SIMMs, use the SIMM removal tool. See *You Oughta Know* for SIMM tool instructions.

**To 2.5 megabytes:** Remove the two 256K SIMMS from positions 3 and 4, and install two 1 MB SIMMs in those positions. Leave the two 256K SIMMs in positions 1 and 2. Place the removed 256K SIMMs in an antistatic bag, and return them to the customer.

**To 4 megabytes:** Remove the four 256K SIMMS, and install four 1 MB SIMMs. Place the removed 256K SIMMs in an antistatic bag, and return them to the customer.

5. If you are upgrading a 2-megabyte Macintosh SE, perform the following steps:

- a) Locate the jumper (Figure 13, #3). Using pliers, completely remove the jumper from the three-pin jumper block.

- b) Perform the steps that follow for your upgrade:

**To 2.5 megabytes:** Add two 256K SIMMS to SIMM sockets 1 and 2.

**To 4 megabytes:** Add two 1 MB SIMMs to SIMM sockets 1 and 2.

6. Replace the main logic board, and replace the cover.

---

## □ MACINTOSH SE/30 SIMM UPGRADES

### **RAM Configurations**

The Macintosh SE/30 can be configured with 1 MB, 2 MB, 4 MB, 5 MB, or 8 MB of RAM memory. The redesigned Macintosh SE/30 logic board has 8 SIMM sockets, and can use several types of 256K and 1 MB, 120-nanosecond SIMMs.

### **SIMM Arrangements**

The 8 SIMM sockets on the Macintosh SE/30 logic board are arranged in two banks. Bank A (Figure 14, #1) includes the four SIMM sockets nearest the edge of the board (labeled "SIM1" and "SIM2" on the logic board). Bank B (Figure 14, #2) includes the four innermost SIMM sockets (labelled "SIM3" and "SIM4" on the logic board).

There are four guidelines to keep in mind whenever you upgrade a Macintosh SE/30:

- Each bank must either be filled with four like SIMMs (four 256K SIMMS, or four 1 MB SIMMS) or left empty.
- Bank A must be used (filled with SIMMs) first.
- If SIMMs of different memory capacity are used, the higher capacity (1 MB) SIMMs should always fill Bank A, with the lower capacity (256K) SIMMs in Bank B.
- The oversized 256K and 1 MB DIP SIMMs should be installed in Bank A only.

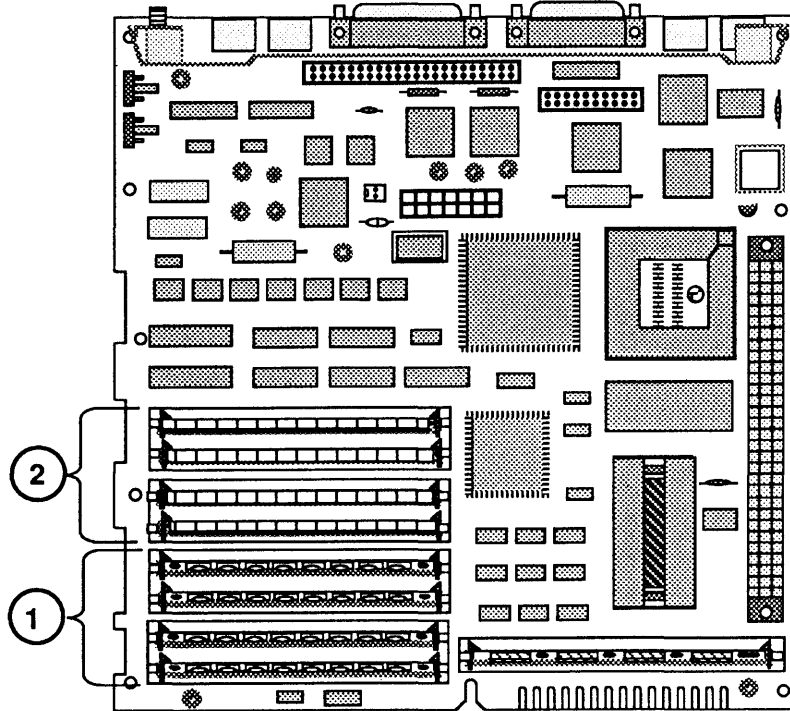


FIGURE 14

## SIMM Upgrades

You can upgrade a standard Macintosh SE/30 (1 or 4 megabytes of RAM) to one of these configurations:

<u>RAM</u>	<u>Bank A</u>	<u>Bank B</u>
2 MB	Four 256K SIMMs	Four 256K SIMMs
5 MB	Four 1 MB SIMMs	Four 256K SIMMs
8 MB	Four 1 MB SIMMs	Four 1 MB SIMMs

To perform this procedure, find the RAM upgrade you are making, and follow steps that are appropriate for the current RAM configuration of your Macintosh SE/30. (For detailed take-apart, CRT discharge, and module installation instructions, see Section 2, Take-Apart.)

**Note:** Whenever you are removing SIMMs, use the SIMM removal tool. See *You Oughta Know* for SIMM tool instructions.

**2 MB  
Upgrade**

1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE/30 onto a soft, grounded workbench pad, and put on your grounding wriststrap—but never put on the grounding wriststrap until **after** you have discharged the CRT.
3. Remove the main logic board and place it on the grounded workbench pad.

---

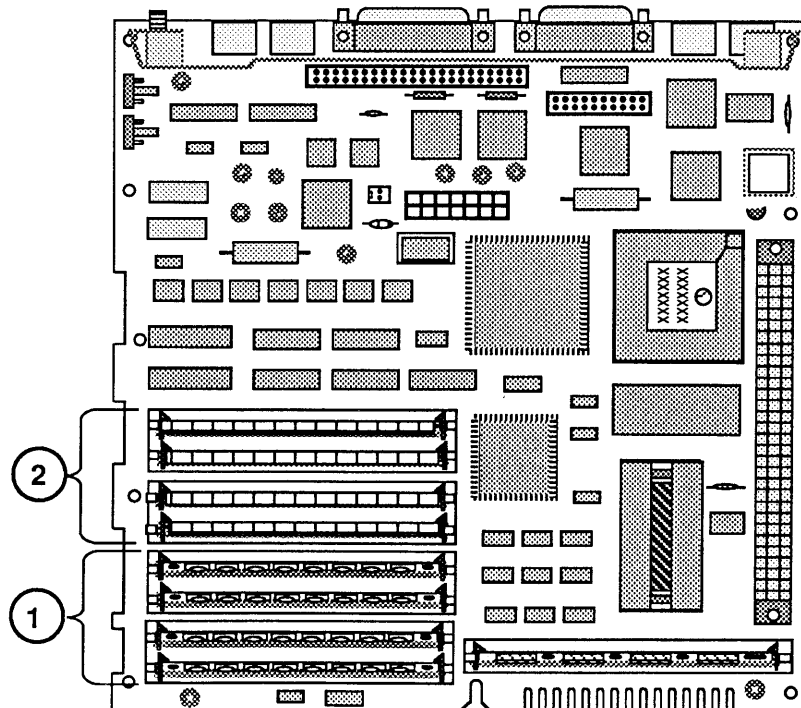
**CAUTION:** Oversized 256K DIP SIMMs should not be installed in Bank B.

---

4. Install four 256K SIMMs in Bank B (Figure 15, #2).
5. Replace the main logic board, and replace the cover.

**5 MB  
Upgrade**

1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE/30 onto a soft, grounded workbench pad, and put on your grounding wriststrap—but never put on the grounding wriststrap until **after** you have discharged the CRT.



**FIGURE 15**

3. Remove the main logic board and place it on the grounded workbench pad.

---

**CAUTION:** *Oversized 256K DIP SIMMs should not be installed in Bank B.*

---

4. If the Macintosh SE/30 has **1 megabyte of RAM**:
  - a) Remove four 256K SIMMs from Bank A (Figure 15, #1) and install them in Bank B (Figure 15, #2).
  - b) Install four 1 MB SIMMs in Bank A.
5. If the Macintosh SE/30 has **4 megabytes of RAM**, install four 256K SIMMs in Bank B (Figure 15, #2).
6. Replace the main logic board, and replace the cover.

#### 8 MB Upgrade

1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE/30 onto a soft, grounded workbench pad, and put on your grounding wriststrap—but never put on the grounding wriststrap until **after** you have discharged the CRT.
3. Remove the main logic board and place it on the grounded workbench pad.

---

**CAUTION:** *Oversized 1 MB DIP SIMMs should not be installed in Bank B.*

---

4. If the Macintosh SE/30 has **1 megabyte of RAM**:
  - a) Remove the four 256K SIMMs from Bank A (Figure 15, #1), place them in an antistatic bag, and return them to the customer.
  - b) Install eight 1 MB SIMMs in Banks A and B.
5. If the Macintosh SE/30 has **4 megabytes of RAM**, install four 1 MB SIMMs in Bank B (Figure 15, #2). Leave the other four 1 MB SIMMs in Bank A.
6. Replace the main logic board, and replace the cover.

---

## ❑ MACINTOSH SE CHASSIS TAB MODIFICATION

### Introduction

Some chassis configurations for the Macintosh SE have left side panels (side opposite the analog board) with protruding tabs. The protruding tab nearest the back of the chassis may interfere with the installation of some third-party cards, or it may interfere with the routing of some third-party card cables. If you encounter this problem when installing third-party cards or cables, perform the following procedure.

### Materials Required

Pliers

### Modification Procedure

Although chassis configurations may differ slightly, the procedure for modifying chassis tabs is the same.

---

**CAUTION:** When bending chassis tabs, make sure the pliers do not slip off the chassis and damage nearby components.

---

To modify a Macintosh SE chassis, bend the tab (Figure 16, #1) with a pair of pliers until the tab is flush with the chassis side panel (Figure 16, #2).

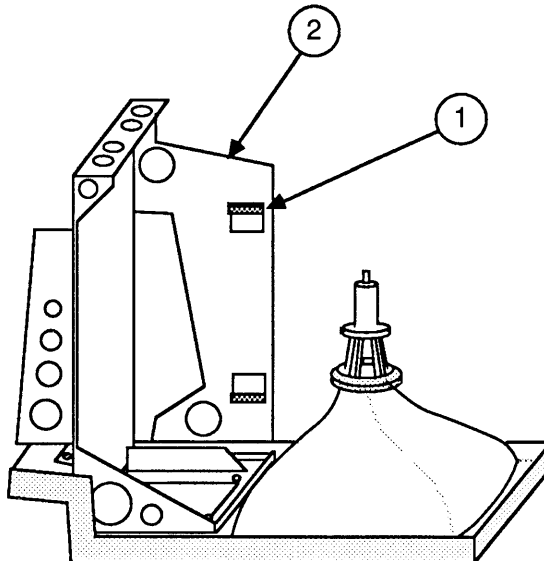


FIGURE 16

---

## ❑ CHASSIS ASSEMBLY

### Introduction

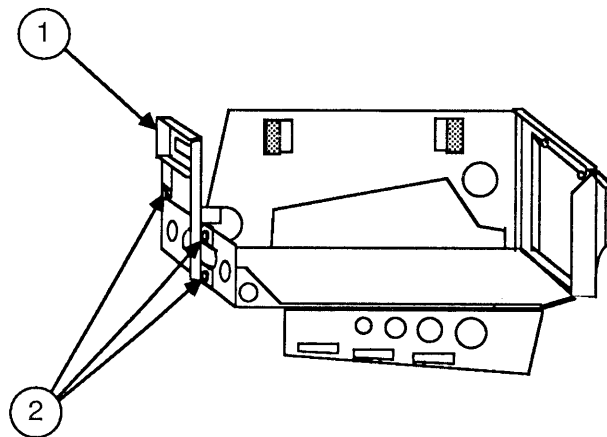
The Macintosh SE and Macintosh SE/30 have a redesigned chassis assembly that consists of two pieces—a chassis, and a separate bracket. The bracket will need to be assembled on the chassis whenever you install the new chassis assembly. The new chassis assembly must be installed if you are upgrading a Macintosh SE with an older chassis to a Macintosh SE/30.

### Materials Required

Chassis  
Bracket  
3 screws  
Phillips screwdriver

### Assembly Procedure

Position the bracket (Figure 17, #1) on the chassis as shown in Figure 17. Align the three screw holes in the bracket and chassis, and install three screws (Figure 17, #2).



**FIGURE 17**



---

## □ MACINTOSH SE/30 LOGIC BOARD UPGRADE

### Introduction

A Macintosh SE/30 Logic Board Upgrade Kit is available to Macintosh SE owners. The Macintosh SE/30 logic board includes a 68030 microprocessor with built-in paged memory management, a 68882 math coprocessor, a new ROM SIMM, and a SWIM chip capable of controlling the 1.4 MB FDHD disk drive.

The upgrade kit includes, in addition to the new logic board: a new bezel (the Macintosh SE/30 supports only one internal drive), a ferrite bead and tie-wrap for EMI protection, a new chassis and bracket, a new RFI shroud, and a return sheet to be filled out when returning the original logic board to Apple.

Four identical RAM SIMMs must be installed in each bank of SIMM slots on the Macintosh SE/30 logic board (or the entire bank must be left empty). Therefore, customers whose Macintosh SE systems have 2 MB or 2.5 MB of RAM will need to obtain additional RAM SIMMs to use the upgraded logic board.

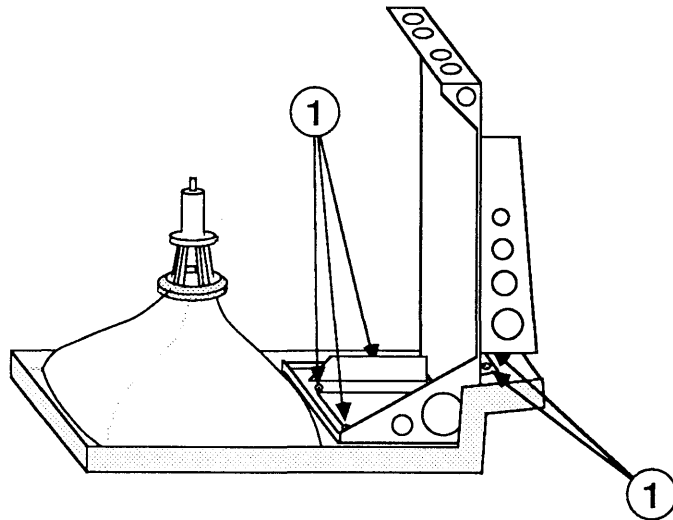
Refer to Section 2, Take-Apart, for referenced procedures.

### Materials Required

Macintosh SE/30 Logic Board Upgrade Kit  
Grounded workbench pad and wriststrap  
Medium Phillips screwdriver  
Torx screwdriver

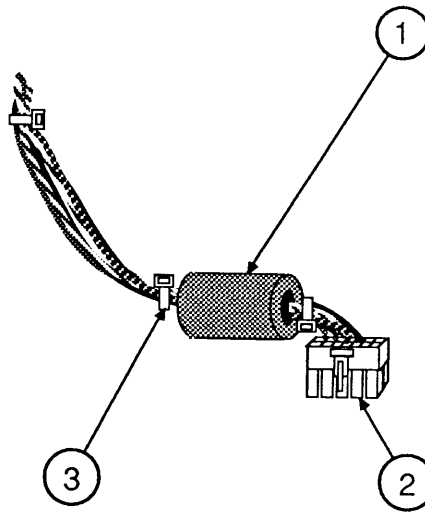
### Installation

1. Remove the cover and discharge the CRT.
2. Place the Macintosh SE on the grounded workbench pad and put on your grounding wriststrap—but never put on the grounding wriststrap until **after** the CRT is discharged.
3. Remove the video board.
4. Remove the main logic board and place it on the grounded workbench pad. Fill out the return sheet and return the main logic board to Apple.
5. Remove the analog board. (Do not remove the power supply from the analog board.)



**FIGURE 18**

6. Remove the SCSI hard disk drive or upper 800K disk drive, whichever is present.
  7. Remove the five Torx screws (Figure 18, #1) that secure the metal chassis to the bezel, and lift out the chassis (with internal disk drive attached).
  8. Remove the CRT and install it in the new bezel.
  9. Assemble the new chassis and bracket (refer to Additional Procedures).
  10. Remove the lower disk drive from the old chassis, and install it on the new chassis.
- Note:** If you are also installing an FDHD Drive Kit, do that installation now.
11. Position the new chassis, with the internal disk drive attached, on the new bezel and install five Torx screws (Figure 18, #1).
  12. If you removed a SCSI hard disk drive from the old chassis, install the drive on the new chassis.
  13. Replace the analog board.



**FIGURE 19**

14. Install the new Macintosh SE/30 logic board.
15. Position the clip-on ferrite bead (Figure 19, #1) around the video board cable as near the video board connector (Figure 19, #2) as possible. Snap the ferrite bead shut.
16. Install a plastic tie-wrap (Figure 19, #3) on the cable to hold the ferrite bead near the connector. Cut off excess tie-wrap.
17. Replace the video board.
18. Install the new insulating paper shroud over the bottom of the Macintosh SE/30, and replace the cover.
19. Attach the two labels included with the upgrade kit:
  - a) Attach the agency approval label over the previous agency label on the back of the cover.
  - b) Attach the 800K drive label in the groove to the right of the disk drive slot on the new bezel.
20. Be sure to run *System Installer* (version 6.0.3 or greater), if you have not done so already.
21. Run the diagnostics to ensure that the upgrade is installed and functioning correctly. Refer to Section 3, Diagnostics, for further information.

---

## □ FDHD UPGRADE FOR THE MACINTOSH SE

### Introduction

The 1.4 MB Apple FDHD disk drive is available to Macintosh SE owners. To upgrade a Macintosh SE so it can support the FDHD drive, you must install the Macintosh SE Apple FDHD Upgrade Kit.

The Upgrade Kit includes the following items:

- Two new ROMs for supporting the FDHD drive
- A single SWIM disk controller chip to replace the IWM chip
- An audio extension cable for reducing EMI interference when using the headphone jack
- The new FDHD disk drive
- System 6.0.3, an Apple product return form, and 800K and FDHD stickers

---

**IMPORTANT:** *The System software must be version 6.0.3 or higher to use the FDHD disk drive in the Macintosh SE. If the software is lower than 6.0.2, the drive will be recognized as an 800K mechanism. Run the Installer (version 6.0.3 or higher) to upgrade the System software.*

---

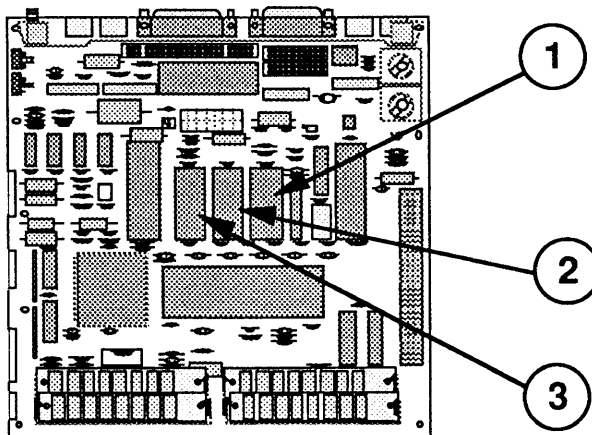
### Materials Required

Grounded workbench pad and wriststrap  
Macintosh SE Apple FDHD Upgrade Kit  
Small Phillips screwdriver  
IC extractor

### Upgrade Procedure

1. Remove the cover and discharge the CRT.
2. Move the Macintosh SE onto a soft, grounded workbench pad and put on your grounding wriststrap. (Never put on a grounding wriststrap until after discharging the CRT.)
3. Remove the video board from the neck of the CRT.
4. Remove the SCSI hard disk drive or upper 800K disk drive, whichever is present.
5. Remove the main logic board and place it on the grounded workbench pad.
6. Remove the lower 800K disk drive.

7. Using the IC extractor, remove the IWM chip (Figure 20, #1) and the two ROM chips (Figure 20, #2 and #3) from the logic board.



**FIGURE 20**

8. Install the SWIM chip and two new ROMs as indicated in the following chart:

ROM	P/N	Location	Figure
SWIM	344-0062	D8	20, #1
HI	342-0701	D6	20, #3
LO	342-0702	D7	20, #2

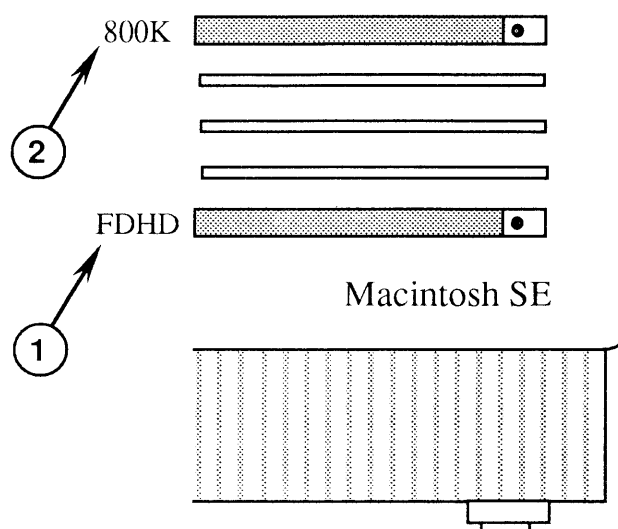
**Note:** The notch at the end of the SWIM chip and each ROM should face the front of the logic board (toward the SIMMs).

9. Install the lower internal (FDHD) disk drive.
10. Replace the main logic board.

**Note:** Customers with dual floppy-drive versions of the Macintosh SE may wish to replace both internal 800K drives with FDHD drives.

11. Replace the SCSI hard disk, upper 800K drive, or second FDHD drive, whichever is present.
12. Replace the video board and cover.

13. Place the FDHD label in the groove next to the lower disk drive slot on the front bezel of the Macintosh SE as shown in Figure 21, #1. If an 800K drive is mounted above the FDHD drive, place the 800K label (Figure 21, #2) next to the upper disk drive slot on the front bezel.



**FIGURE 21**

14. Be sure to run the System Installer (version 6.0.3 or higher), if you have not done so already.
15. Run the diagnostics to ensure that the upgrade is installed and functioning correctly. Refer to Section 3, Diagnostics, for further information.
16. Return to Apple the two ROMs and IWM chip removed from the customer's logic board.

**Note:** Remember to give your customer the audio extension cable included with the Upgrade Kit, and explain its use to the customer. To reduce interference, the audio extension cable (with ferrite bead) must be installed between the customer's audio cable and the audio jack at the rear of the Macintosh SE.



# Macintosh SE and Macintosh SE/30

## Illustrated Parts List

---

### □ CONTENTS

- IPL.3 Internal View (Figure 1)
- IPL.5 Chassis Assembly (Figure 2)
- IPL.7 External Rear Housing (Figure 3)
- IPL.9 Front Bezel (Figure 4)
- IPL.11 Logic Board—Macintosh SE (Figure 5)
- IPL.13 Logic Board—Macintosh SE/30 (Figure 6)
- IPL.15 Analog Board (Figure 7)
- IPL.17 Shipping Fixture, 800K/1.4 MB Drives (Figure 8)
- IPL.17 Dual Internal Drives (Figure 9)
- IPL.19 Internal HDA (Figure 10)

The figures and lists above include all piece parts that can be purchased separately from Apple for the Macintosh SE and Macintosh SE/30, along with their part numbers. These are the only parts available from Apple. Refer to your *Apple Service Programs* manual for prices.



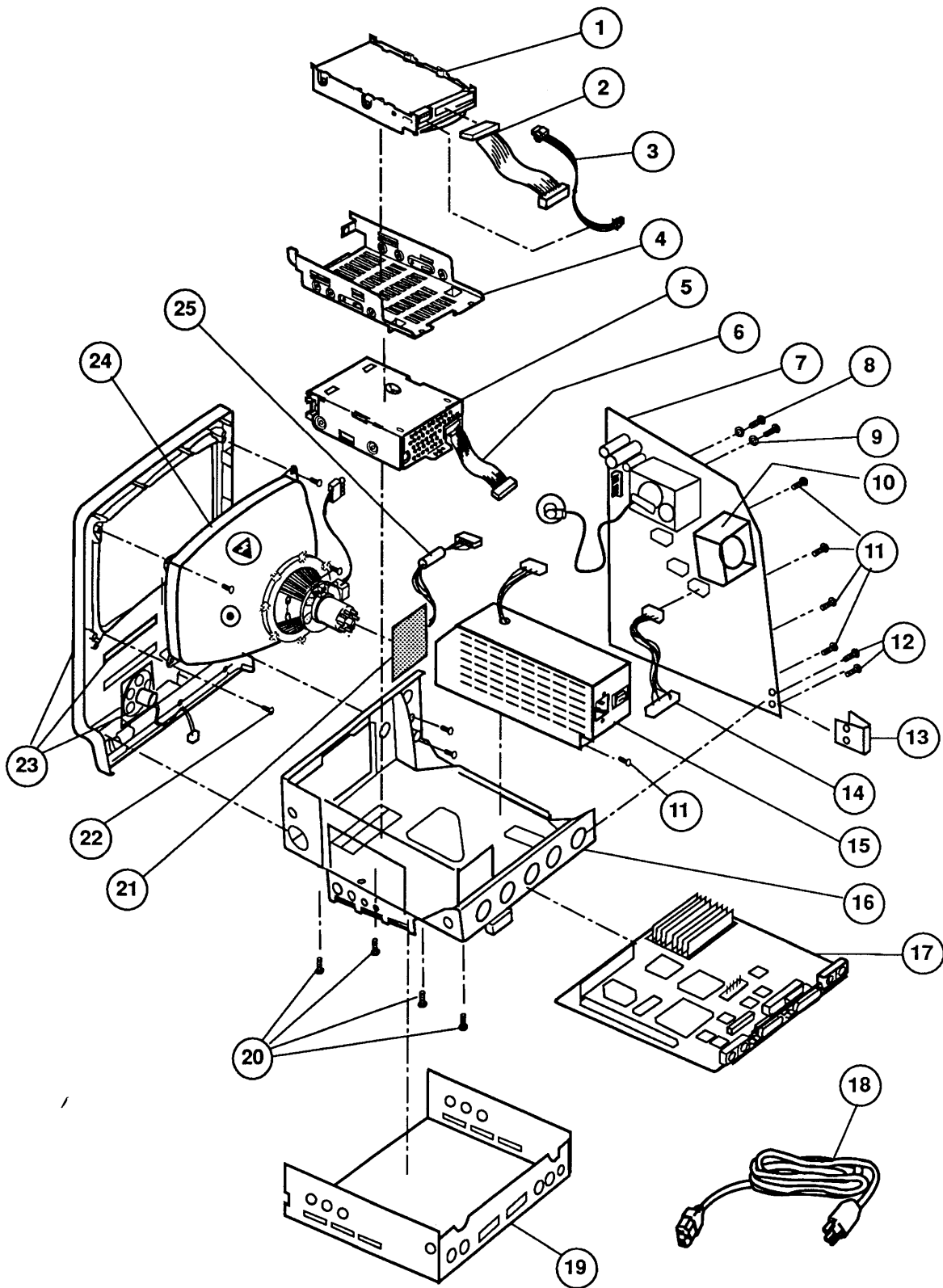
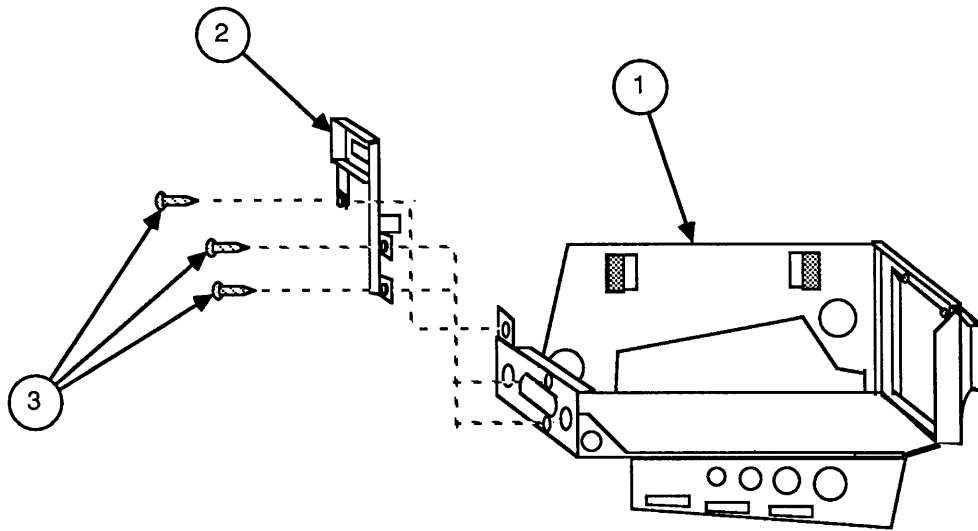


FIGURE 1

## □ INTERNAL VIEW (Figure 1)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
—	590-0527	LED (fits 1-Inch-Height drives)
—	602-0210	Service Packaging, 800K/1.4 MB Drive
1	661-0373	HDA, Internal, 20 MB, 3.5-Inch SCSI, Rev. A
	661-0612	HDA, Internal, 20 MB, 3.5-Inch SCSI, Rev. B
	661-0464	HDA, Internal, 40 MB, 3.5-Inch SCSI
	661-1629	HDA, Internal, 40 MB, 3.5-Inch, 1-Inch-Height SCSI (use carrier 805-0952)
	661-0600	HDA, Internal, 80 MB, 3.5-Inch SCSI
2	590-0211	Cable, Internal HDA SCSI
3	590-0505	Cable, Internal HDA Power (1 x 4-pin)
4	805-5066	Carrier, HDA, Internal, 3.5-Inch, SCSI, High Side-Mounting Holes
	805-0952	Carrier, HDA, Internal, 3.5-Inch, SCSI, Low Side-Mounting Holes (for HDA 661-1629)
5	661-0345	800K Mechanism, Apple 3.5-Inch Drive
	661-0474	1.4 MB Mechanism, Apple 3.5-Inch Drive
6	590-0437	Cable, Internal 3.5-Inch Drive (yellow stripe)
7	661-0371	Analog Board, Macintosh SE and SE/30
8	416-1310	Screw, M 3 x 5 x 10 PNCR
9	860-0282	Washer, Lock, Internal Tooth
10	076-0311	Fan Kit
11	462-3100	Screw, M 3 x .5 x 6
12	470-2101	Screw, M 2.9 x 10
13	805-0576	Lower Ground Clip
14	590-0392	Cable, Logic Board Power Interconnect
15	661-0370	Power Supply, Macintosh SE and SE/30
16	805-0938	Chassis, Macintosh SE and SE/30
17	661-0369	Logic Board, Macintosh SE (replaced by 661-0526)
	661-0490	Logic Board (revised), Macintosh SE, (replaced by 661-0526)
	661-0526	Logic Board, Macintosh SE 800K (without RAM)
	661-0510	Logic Board, Macintosh SE/30 (replaced by 661-0527)
	661-0527	Logic Board, Macintosh SE/30 (without RAM)
	661-0536	Logic Board, Macintosh SE (SuperDrive) (without RAM)
18	590-0380	Cable, AC Power
19	805-5060	Shroud, RFI, Macintosh SE
	805-0969	Shroud, RFI, Macintosh SE/30
20	462-4100	Screw, M 3.5 x .6 x 8, PNCR Rec
21	982-0024	Video Board, Vertical Macintosh SE and SE/30
22	426-1001	Screw, Tap, M 4.22 x 1.41 x 16, Pan, Torx, Zinc (CRT and chassis)
23	810-0399	Front Bezel with Speaker, Slot Cover, Macintosh SE (800K)
	810-0422	Front Bezel with Speaker, Slot Cover, Macintosh SE (SuperDrive)
	630-5499	Front Bezel, with Speaker, Macintosh SE/30
24	076-0103	CRT and Yoke Assembly
25	159-0061	Ferrite Bead, Clamp-on



**FIGURE 2**

---

## □ CHASSIS ASSEMBLY (Figure 2)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	805-0938	Chassis, Macintosh SE and SE/30
2	805-0939	Bracket, Macintosh SE and SE/30
3	470-2101	Screw, M 2.9 x 10

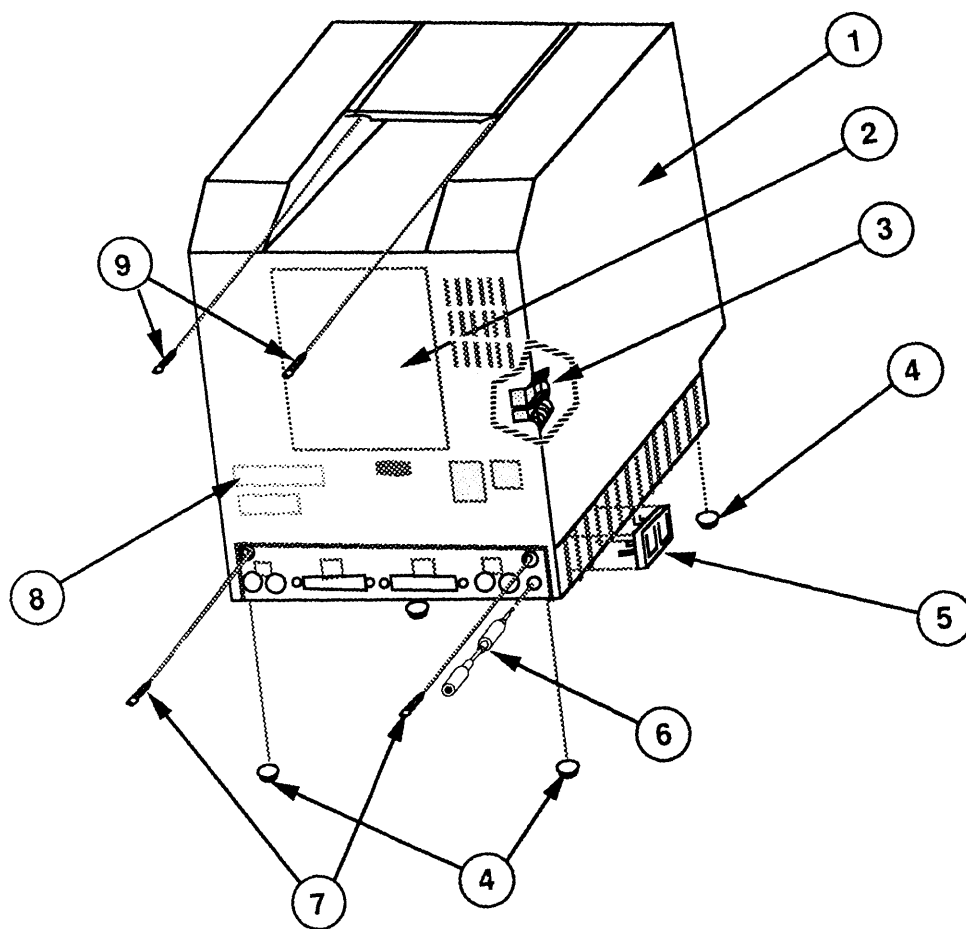


FIGURE 3

---

## □ EXTERNAL REAR HOUSING (Figure 3)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	630-5271	Rear Housing Assembly with Door and Feet
2	825-2021	Agency Approval Label, Macintosh SE
	825-2043	Agency Approval Label, Macintosh SE/30
3	805-0575	Upper Ground Clip
4	865-0051	Foot, Platinum
5	815-1008	Reset/Interrupt Switch
6	590-0612	Audio Extension Cable
7	435-5002	Screw, Tap, 8-32 x .625, Fill, Torx, Black Zinc Oxide (Main Case)
8	815-0986	Rear Housing Door
9	426-1007	Screw, Tap, M 4.22 x 1.41 x 16, Pan, Torx, Zinc (Main Case)

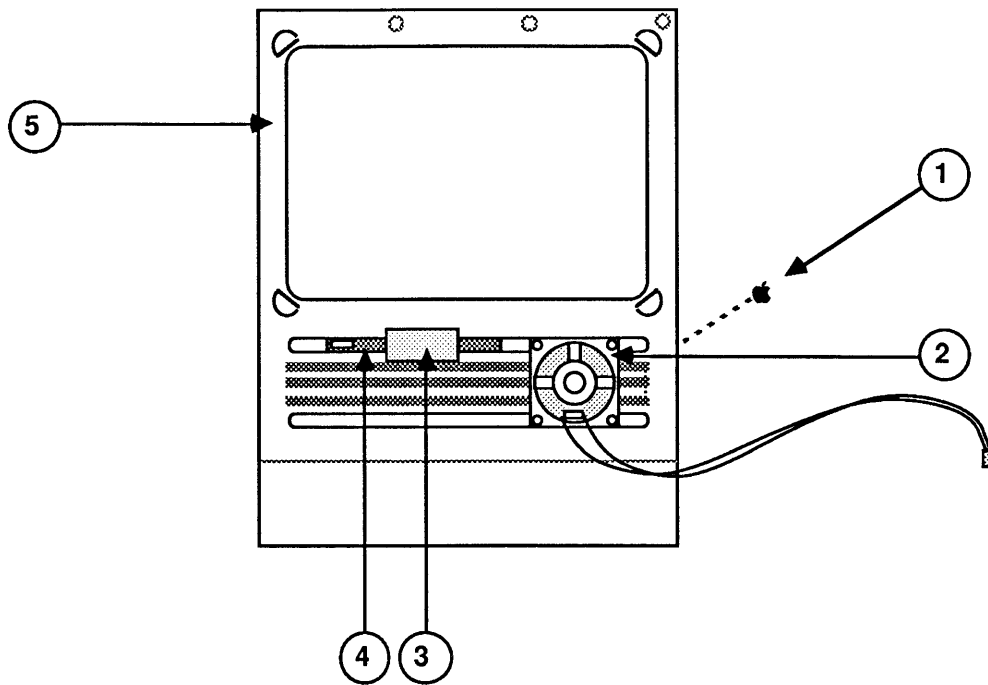


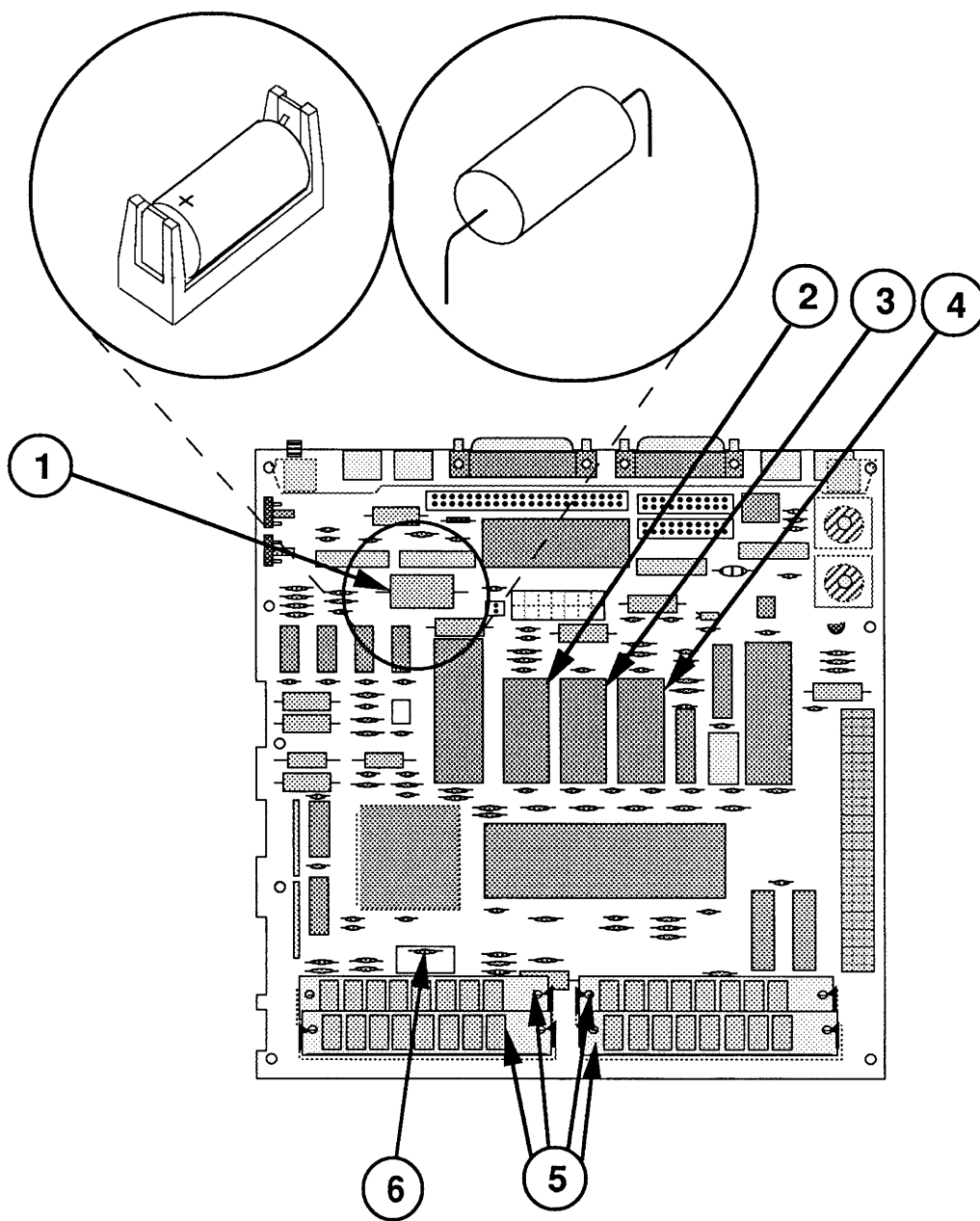
FIGURE 4

---

## □ FRONT BEZEL (Figure 4)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	825-1256	Logo Plate Label, Macintosh SE and SE/30
2	600-0393	Speaker
3	805-0908	Slot Cover Retainer, Macintosh SE
4	630-5330	Slot Cover Bezel, Macintosh SE
5	810-0399	Front Bezel with Speaker, Slot Cover, Macintosh SE (800K)
	810-0422	Front Bezel with Speaker, Slot Cover, Macintosh SE (FDHD)
	630-5499	Front Bezel with Speaker, Macintosh SE/30






**FIGURE 5**

---

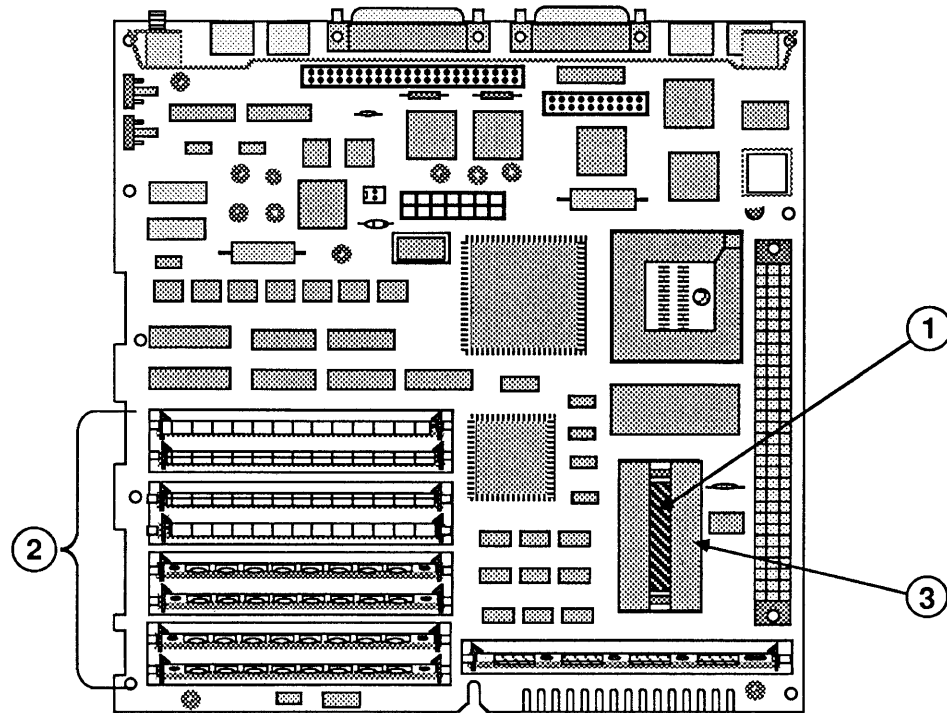
## □ LOGIC BOARD – MACINTOSH SE (Figure 5)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	742-0009	Lithium Battery (with leads)
	742-0010	Lithium Battery (without leads)
2	661-0701	ROM, High, Macintosh SE Apple SuperDrive Upgrade
3	661-0702	ROM, Low, Macintosh SE Apple SuperDrive Upgrade
4	344-0062	IC, SWIM
5	661-0402	SIMM, 256K, 120 ns
	661-0403	SIMM, SOJ, 1 MB, 120 ns
	661-0410	SIMM, DIP, 1 MB, 120 ns
	661-0494	SIMM, DIP, 256K, 120 ns
	661-0519	SIMM, SOJ, 256K, 80 ns
	661-0520	SIMM, SOJ, 1 MB, 80 ns
6	101-4151	Resistor, 150 Ohms, .25 W, ±5%

---

**IMPORTANT:** Refer to the  Quick Reference: SIMM Compatibility chart for SIMM compatibility. Follow this chart carefully! Some SIMMs may falsely appear to be interchangeable.

---




**FIGURE 6**

---

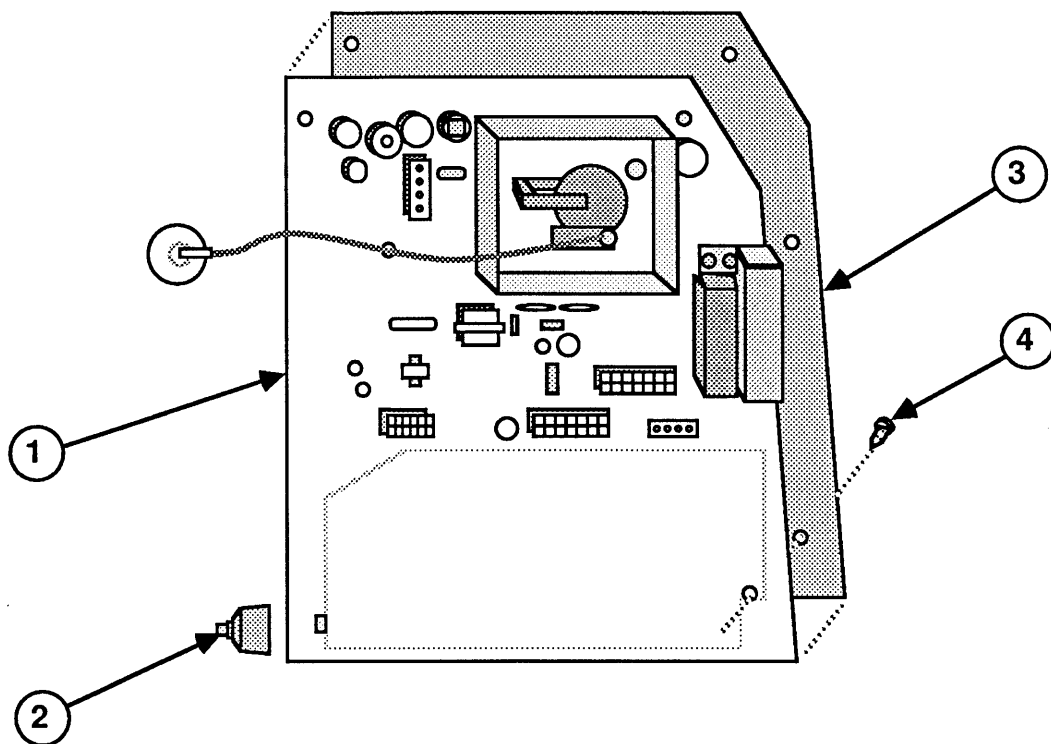
## ❑ LOGIC BOARD – MACINTOSH SE/30 (Figure 6)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	742-0011	Lithium Battery (without leads)
2	661-0402	SIMM, 256K, 120 ns
	661-0403	SIMM, SOJ, 1 MB, 120 ns
	661-0494	SIMM, DIP, 256K, 120 ns
	661-0410	SIMM, DIP, 1 MB, 120 ns
	661-0519	SIMM, SOJ, 256K, 80 ns
	661-0520	SIMM, SOJ, 1 MB, 80 ns
	661-0719	SIMM, SOJ, 1 MB, 80 ns
3	520-0344	Battery Holder Cover

---

**IMPORTANT:** Refer to the  Quick Reference: SIMM Compatibility chart for SIMM compatibility. Follow this chart carefully! Some SIMMs may falsely appear to be interchangeable.

---

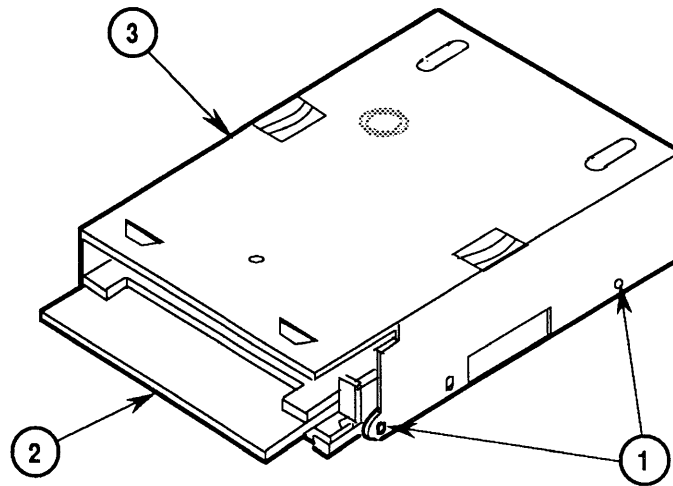


**FIGURE 7**

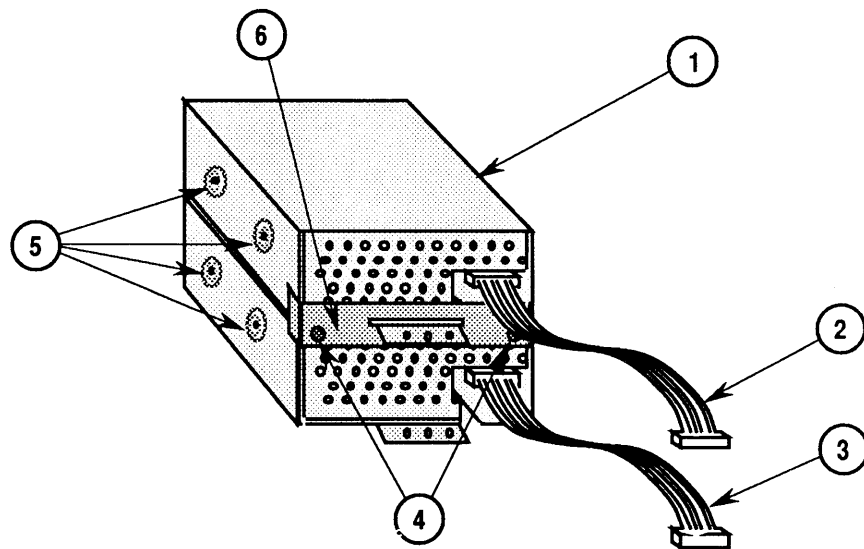
---

□ **ANALOG BOARD (Figure 7)**

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	661-0371	Analog Board, Macintosh SE and SE/30
2	865-0047	Brightness Knob
3	725-0020	Insulator, Analog Board
4	830-0240	Fastener, Snap-in Plastic



**FIGURE 8**



**FIGURE 9**

---

## ❑ SHIPPING FIXTURE, 800K/1.4 MB DRIVES (Figure 8)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
–	661-0345	800K Mechanism, Apple 3.5 Drive
–	661-0474	1.4 MB Mechanism, Apple 3.5 Drive
1	462-3401	Screw, M 3 x 6, with two washers
2	003-0003	Packing Disk, 2-sided (for transporting)
3	805-5050	Metal Housing/Shipping Fixture, 800K/1.4 MB Mechanism

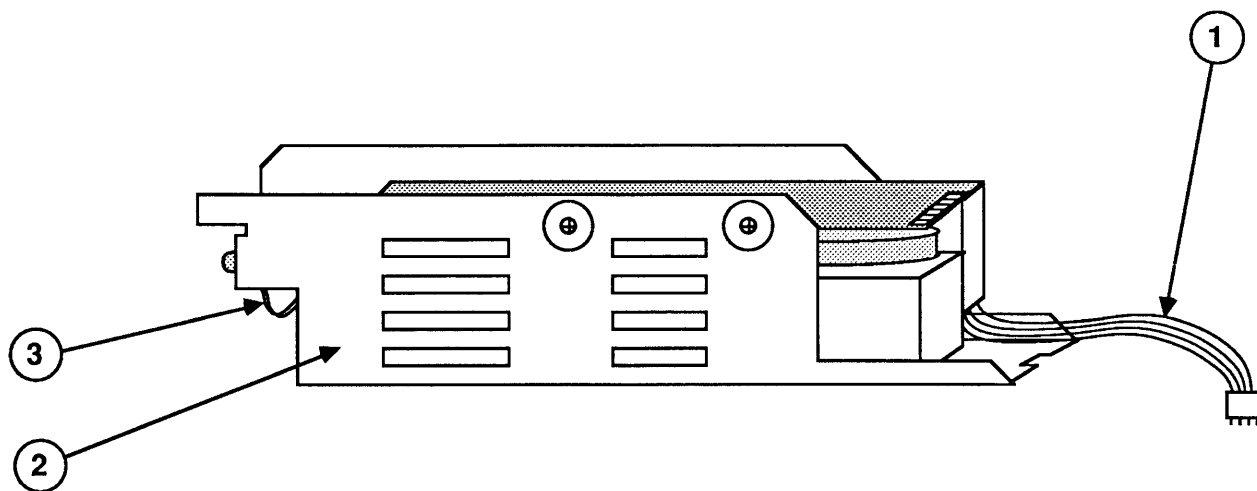
The metal housing/shipping fixture is required when using 800K/1.4 MB drive packaging.

---

## ❑ DUAL INTERNAL DRIVES (Figure 9)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
–	076-0439	Dust Shield, 1.4 MB Apple SuperDrive, Package of 5
1	805-5050	Metal Housing/Shipping Fixture, 800K/1.4 MB Mechanism
2	590-0188	Cable, 3.5 Internal Drive (red or yellow stripe)
3	590-0437	Cable, 3.5 Internal Drive (yellow stripe)
4	462-4100	Screw, M 3.5 x .6 x 8, PNCRS Rec
5	462-3401	Screw, M 3 x 6, with two washers
6	805-0914	Back Plate, Drive 2





**FIGURE 10**

---

## □ INTERNAL HDA (Figure 10)

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
–	602-0164	Service Packaging, HDA, 3.5-inch, half-height (replaced by 602-0282 or 602-0308)
–	602-0282	Service Packaging, HDA, 3.5-inch, half-height; and 3.5-inch, 1-inch-height, with carrier
–	661-0373	HDA, Internal, 20 MB, 3.5-inch SCSI, Rev. A
–	661-0464	HDA, Internal, 40 MB, 3.5-inch SCSI
–	661-1629	HDA, Internal, 40 MB, 3.5-inch, 1-inch-height SCSI
–	661-0600	HDA, Internal, 80 MB, 3.5-inch SCSI
–	661-0612	HDA, Internal, 20 MB, 3.5-inch SCSI, Rev. B
1	590-0505	Cable, Internal Power, HDA
2	805-5066	Frame, HDA, Internal, 3.5-inch SCSI
3	590-0237	Cable, HDA LED (red)
	590-0506	Cable, HDA LED (amber)