Macintosh® Computers
Volume II

Service Guide

For the:
Macintosh Classic II,
PowerBooks 100 & 140/170,
Quadra 700 and Quadra 900

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Apple Service Guide

Macintosh Computers—Introduction

Introduction

The *Apple Service Guide for Macintosh Computers, Volume II,* is a companion volume to the *Apple Service Guide for Macintosh Computers* (last updated in March, 1991). Volume II covers the newest Macintosh computers and updates some of the information included in Volume I.

Volumes I and II of the *Apple Service Guide for Macintosh Computers* are two in a series of booklets being developed to help Apple-certified technicians troubleshoot and repair Apple products at their customers' sites. The *Apple Service Guide for LaserWriter Printers* is currently available, and guides covering networking and communications and Macintosh peripherals are in development.

The *Apple Service Guides for Macintosh Computers* do not replace *Service Source.* The *Apple Service Guides* condense information found in the *Apple Service Technical Procedures*, *Service Source*, and other Service publications, and present this information in a booklet format that is easy to use and easy to carry. The guides include *only* information that experienced technicians absolutely need to quickly and reliably service Macintosh computers at the customer's site.

Guide Contents

Apple Service Guide for Macintosh Computers, Volume II, includes:

Safety procedures and practices
Tab 1: Classic II
Tab 2: PowerBook 100
Tab 3: PowerBook 140/170
Tab 4: Quadra 700
Tab 5: Quadra 900
Tab 6: General Information

Macintosh Tabs (tabs 1-5) contain information specific to these computers, including exploded-view drawings, parts lists, symptom/cure charts, troubleshooting flowcharts, system specifications and upgrades, and some take-apart procedures.

General Information (tab 6) contains updated SIMM identification charts; computer port locations, cable connectors, and pin-outs (for the new computers and new ports only); a parts list of the ADB devices; and tables of updated module symptom codes, including TechStep codes and failure messages.

IMPORTANT: When ordering a replacement module or spare part, be sure to check the part number given in the guide against the current price pages in the* Apple Service Programs *manual. Remember that the* Apple Service Guides *are not updated on a regular basis.

Ten Rules to CRT Safety

1. **Do not work on a monitor alone.** In case of an accident, having someone nearby—and having someone trained in CPR—could save your life.

2. **Remove all jewelry before performing repairs on a CRT.** Removing these conductors reduces the possibility of electric shock.

3. **Never use a grounding wriststrap or heelstrap or work on a grounded workbench mat when discharging a monitor or when performing live adjustments.** Grounding straps and mats are used to protect sensitive components from ESD damage and should be used only when working on "dead" (uncharged) equipment.

4. **Wear safety goggles when working with a CRT.** The CRT contains a high vacuum. If cracked or broken, the CRT can implode (collapse into itself). To protect your eyes, always wear safety goggles.

5. **Before working inside a monitor, turn off the power and disconnect the AC power cord.** Certain parts of a monitor chassis are hot (electrified) when the monitor is under power. Never work on a monitor under power except when making live adjustments.

6. **Keep one hand in your pocket or behind your back when working on a live monitor.** This reduces the risk of current passing through your body, should you accidentally contact high voltage.

7. **Always discharge the anode before touching anything inside the monitor.** High voltage (up to 12,000 volts DC) can be present on the anode and other components—even when power is off.

8. **Never touch the anode connector or the anode aperture.** When a CRT is replaced, the anode connector is removed, exposing the anode. The anode can retain a charge of several thousand volts even when power is off and can regain some charge even after being discharged.

9. **Do not pick up or handle a CRT by its neck.** To prevent an implosion, take every precaution against breaking the tube. Be especially careful with the neck, where the tube is thinnest.

10. **In addition, never touch the following components when adjusting a live Macintosh CRT:**

    - The back of the power switch
    - The yoke wires
    - The anode connector
    - The anode wire
    - The flyback transformer

WARNING: The Classic II contains high voltage and a high-vacuum picture tube. To prevent serious personal injury when performing video adjustments with the power on, read the CRT safety precautions and the live adjustment rules in Volume I of the *Apple Service Guide* for Macintosh Computers.

WARNING: Failure to follow the rules for safe CRT discharge could result in serious injury or property damage. For the Classic II, you must discharge the CRT to the ground lug to prevent damage to the logic board.

CAUTION: When you unwrap, install, or replace modules, follow the appropriate electrostatic discharge (ESD) precautions. The PowerBooks are very susceptible to damage from electrostatic discharge. For more ESD information, see ESD Prevention under Safety in this guide.

CAUTION: The power adapters on the Macintosh Portable and the PowerBook computers are not interchangeable. You will damage the computer if you try to use the power adapters interchangeably.

WARNING: The lithium battery used in the Macintosh Classic II has a potential for explosion or overheating if improperly handled and cannot be recharged. A violent chemical reaction may occur if you attempt to recharge a lithium battery.

WARNING: Do not short the battery. The battery may become hot enough to burn you.

WARNING: A "dead" lithium battery is considered hazardous waste and has some potential for explosion if improperly handled. Mark the battery "Dead," place it in a zip-lock wrapper and the packaging used to ship the replacement battery, and return the dead battery to Apple, where it will be disposed of following EPA guidelines. Exception: If the battery is physically damaged, do not return it to Apple; dispose of the battery locally according to local ordinances.

ESD Prevention

Electrostatic discharge (ESD) can irreparably damage the sensitive CMOS chips and printed circuitry of modern electronic components. Plastic utensils, styrofoam cups, polyester clothing, even the ungrounded touch of your hand carry sufficient electrostatic charges to damage electronic components. Follow the ESD prevention rules and procedure below to prevent ESD damage.

ESD Prevention Rules

1. Before working on a device containing a printed circuit, ground yourself and your equipment. However:

WARNING: Make sure that you are *not grounded* when:
- **You work on plugged-in equipment**
- **You discharge a cathode-ray tube (CRT)**
- **You work on an unplugged CRT that has not yet been discharged**

2. Do not touch anybody who is working on integrated circuits. You could "zap" the equipment through the technician—even if the technician is grounded.
3. Use static-shielding bags for boards and chips during storage, transportation, and handling.
4. Handle all ICs by the body, not the leads.
5. Do not wear polyester clothing or bring plastic, vinyl, styrofoam or other nonconductors into the work environment.
6. Place components on antistatic, conductive, or foam rubber mats.
7. If possible, keep the humidity in the service area between 70% and 90%, and use an ion generator.
8. If an ESD pad/workstation is not available, connect the computer to a power outlet and touch the metal power supply to discharge electrostatic charges.

Setting Up an ESD-Safe Workstation

Materials Required
Conductive workbench mat with ground cord
Wriststrap with built-in 1-megohm resistor and ground cord
Equipment ground cord with alligator clips
Ground/polarity tester

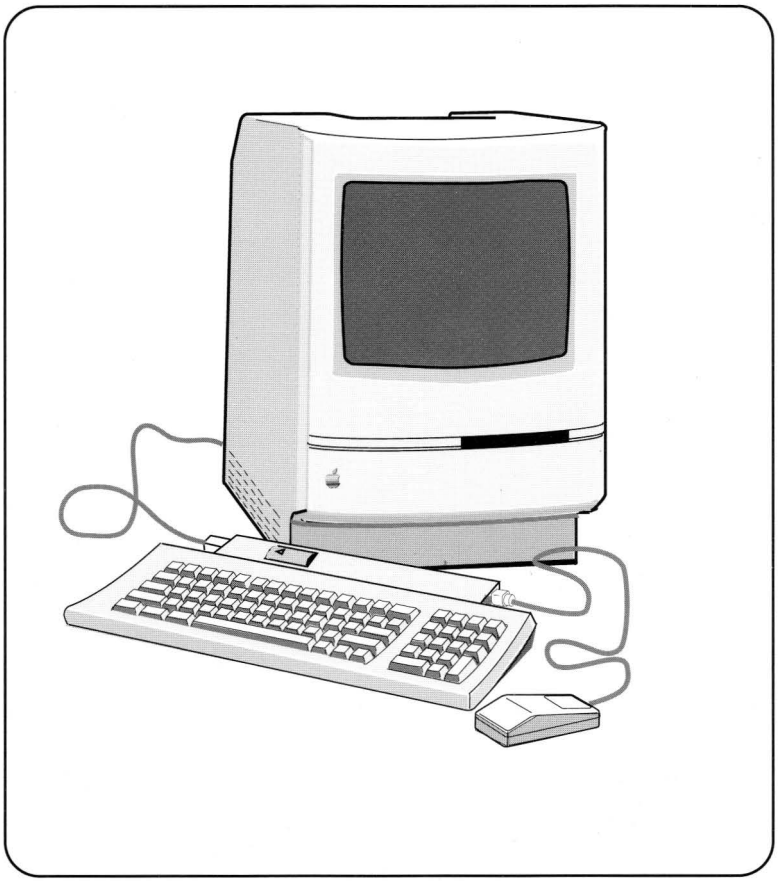
Setup and Procedure

1. Remove all nonconductive materials from the area.
2. Use a ground/polarity tester to verify proper grounding of the power outlet.
3. Connect the ground cord of the workbench mat to ground.
4. Use a wriststrap ground cord. Fasten it to the workbench mat and to the wriststrap. Make sure the metal on the wriststrap touches your skin.
5. Ground the equipment you are working on to the grounded workbench mat.

Macintosh Classic II

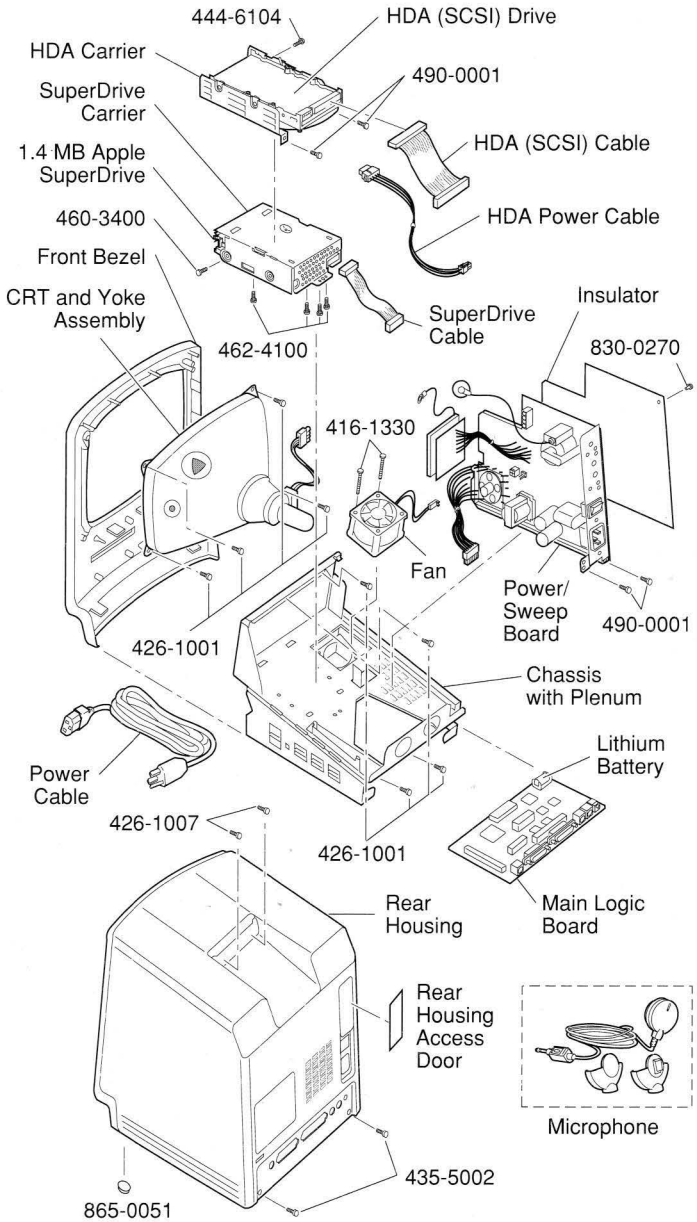
Table of Contents

Contents **Page**



Macintosh Classic II

Exploded View



Macintosh Classic II

Parts List

Cable, Power AC, 110 V, Smoke	590-0380
Chassis with Plenum	630-5818
Screw, Tap, 4.22 x 1.41 x 13 mm, Torx, Zinc (chassis to bezel)	426-1001
CRT and Yoke Assembly	630-5954
Screw, Tap, 4.22 x 1.41 x 13 mm, Torx, Zinc (CRT to bezel)	426-1001
Fan	982-0055
Screw, 3 x .5 x 30 mm (fan to plenum)	416-1330
Floppy Disk Drive, Apple 1.4 MB SuperDrive, Internal	661-0474
Cable, 1.4 MB SuperDrive, Internal (red stripe)	590-0167
Drive Carrier, 800K or SuperDrive	805-5050
Screw, 3 x .5 x 6 mm (SuperDrive carrier to SuperDrive)	460-3400
Screw, Apple SuperDrive (SuperDrive carrier to chassis)	462-4100
Service Packaging, 800K and 1.4 MB Apple SuperDrive	602-0210
Front Bezel	630-6046
HDA, 1" Internal, 40 MB, 3.5" SCSI	661-0614
HDA, 1" Internal, 80 MB, 3.5" SCSI	661-0624
Cable, HDA, Internal (SCSI connector cable)	590-0211
Cable, HDA, Power	590-0521
HDA Carrier, Internal 3.5" SCSI	805-0950
Screw, 6 - 32 x .250 (HDA carrier to HDA)	444-6104
Screw (HDA carrier to SuperDrive carrier)	490-0001
Service Packaging, 3.5" HDA, 1-Inch-Height, Without Carrier	602-0308
Main Logic Board	661-0672
Lithium Battery (without leads)	742-0011
Microphone	699-5103
Power/Sweep Board, 110 V (Rev. B)	661-0651
Power/Sweep Board, 220 V (Rev. B)	661-0652
Insulator, Power/Sweep Board	815-1216
Rivet, Nylon Snap-In, Black	830-0270
Screw (power/sweep to chassis)	490-0001
Rear Housing Assembly with Feet	630-6045
Platinum Foot	865-0051
Rear Housing Access Door	815-1195
Screw, Tap, 8 - 32 x .625, Fill, Torx, Zinc Oxide (case bottom)	435-5002
Screw, Tap, 4.22 x 1.41 x 16 mm, Torx, Zinc (case top)	426-1007
SIMMs	
SIMM, 1 MB, SOJ, 80 ns	661-0520
SIMM, 1 MB, SOJ, 80 ns	661-0719
SIMM, 2 MB, SOJ, 80 ns	661-0643

Macintosh Classic II
Video Adjustments

Video adjustments **may** be necessary whenever you replace the CRT or the power/sweep board. All video adjustments (except the tilt adjustment) are made from the service panel at the back of the Classic II under the service panel door **(see Figure).**

WARNING: Video adjustments are performed with the power on. Review the CRT safety rules before performing these procedures.

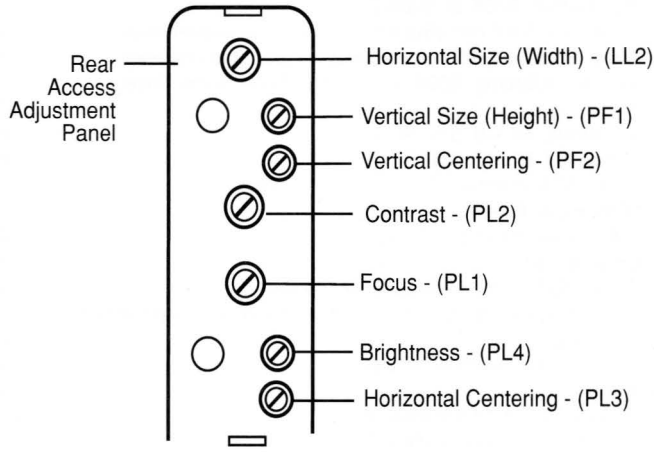


Figure: Service Panel Adjustments

You must use the *MacTest MP* Brightness and Video test patterns to adjust the Macintosh Classic II correctly.

Before performing the following adjustments, make sure the computer has been on for at least 30 minutes.

Brightness and Contrast

1. Turn the computer so that the back is toward you, and place a mirror in front of the CRT screen. Remove the service panel door.

2. Boot *MacTest MP* and select **Brightness** from the Options menu to bring up the first brightness screen.

3. Set your light meter (Sekonic Multi-Lumi, model L-248) for the 10-to-18 range.

4. Using a plastic flat-blade tweaker, adjust contrast pot PL2 (**see Figure**) so that the luminance at the center of the screen reads at the high end of the black area between 10 and 11 on the light meter.

5. Click the mouse button to go to the next brightness level.

6. Set the light meter for the 2-to-10 range. Using a plastic hex alignment tool, adjust brightness pot PL4 (**see Figure**) so that the luminance at the center of the screen reads at the top end of 7 on the light meter.

7. Click the mouse button again to go to the next brightness level.

8. Reset the light meter for the 10-to-18 range and be sure the luminance at the center of the screen reads at the high end of the black area between 10 and 11 on the light meter. If it does not, repeat steps 2 through 8.

Centering Adjustments

To generate the test patterns for the following adjustments, select **Screen Patterns** from the *MacTest MP* main menu. Click to advance to the pattern you need.

1. Select the all-white or crosshatch pattern (with white background). Using a plastic hex alignment tool, adjust horizontal centering pot PL3 to center the display horizontally within the bezel.

2. Using a plastic hex alignment tool, adjust vertical-centering pot PF2 to center the picture vertically within the bezel.

Size Adjustments

To generate the test patterns for the following adjustments, select **Screen Patterns** from the logic board tests on the *MacTest MP* main menu. Click to advance to the pattern you need.

1. Select the all-white or crosshatch display (with white background). Using a plastic hex alignment tool, adjust horizontal size pot LL2 until the picture is approximately 7 inches wide.

2. Using a plastic hex alignment tool, adjust vertical size pot PF1 until the picture is approximately 4.7 inches high.

Focus Adjustment

To generate the test patterns for the following adjustments, select **Screen Patterns** from the logic board tests on the *MacTest MP* main menu. Click to advance to the pattern you need.

– Select the focus display (with % signs). Using a plastic flat-blade tweaker, adjust focus pot PL1 for the best overall focus.

Tilt Adjustment

1. Remove the cover and discharge the CRT. Turn the computer so that the back is facing you, and place a mirror in front of the CRT screen.

2. Loosen the **yoke clamp screw** two or three turns **(see Figure).**

3. Connect the power cord and switch the power on.

4. Place one hand behind your back, and with your other hand grasp only the plastic spokes of the **yoke collar (see Figure)**. Rotate the **yoke collar** until the top and bottom edges of the picture appear parallel with the top and bottom edges of the bezel. **(Do not move the magnets, which are preset by the manufacturer and should not be adjusted.)**

5. Switch the power off, unplug the computer, and discharge the CRT.

6. Hold the **yoke collar** in position and tighten the yoke clamp screw so that the **yoke collar** will not slip **(see Figure)**. Don't overtighten.

7. Connect the power cord and switch the power on to verify that the adjustment is still correct.

8. Replace the cover.

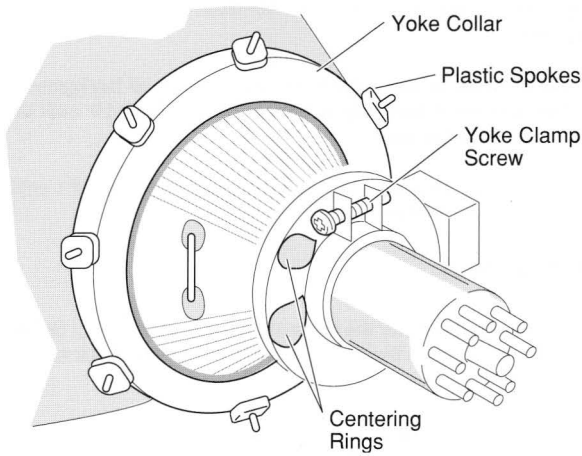


Figure: CRT Adjustment Controls

Macintosh Classic II
Symptom/Cure Chart

Video Problems	Solutions
Screen dark; audio and drive operate	1. Readjust brightness. 2. Readjust cutoff. 3. Check yoke cable connection. 4. Replace power/sweep board. 5. Replace logic board. Retain customer's SIMMs. 6. Replace CRT.
Screen bright and audio present, but no video information visible	1. Replace power/sweep board. 2. Replace logic board. Retain customer's SIMMs.
Screen completely dark and fan not running	– Replace power/sweep board.
Screen displays single vertical/horizontal line	1. Replace power/sweep board. 2. Replace logic board. Retain customer's SIMMs. 3. Replace CRT.
Screen displays vertical/horizontal bars or stripes	1. Replace power/sweep board. 2. Replace logic board. Retain customer's SIMMs.
Screen displays white dot in center of screen	1. Check yoke cable connection. 2. Replace power/sweep board. 3. Replace CRT.
Screen jitters	1. Move computer away from adjacent electrical equipment that may cause interference. 2. Replace power/sweep board.

Peripheral Problems	Solutions
Cursor does not move	1. Check mouse connection. 2. If mouse was connected to a keyboard, connect it to a rear ADB port. If mouse now works, replace keyboard. If mouse does not work in any ADB port, replace mouse. 3. Replace logic board. Retain customer's SIMMs.
Cursor moves, but clicking the mouse button has no effect	1. Replace mouse. 2. Replace logic board. Retain customer's SIMMs.

continued...

Macintosh Classic II
Symptom/Cure Chart

Peripheral Problems (continued)	Solutions
No response to any key on the keyboard	1. Check keyboard connection to rear ADB port. 2. Replace keyboard cable. 3. Replace keyboard. 4. Replace logic board. Retain customer's SIMMs.
Cannot double-click to open a disk, application, or server	1. Remove extra system files on hard disk. 2. Clear parameter RAM by holding down <Option> <Command> <R> <P> keys during power on, and select **Control Panel** from Apple menu. Reset mouse controls. 3. If mouse was connected to a keyboard, connect it to a rear ADB port. If mouse works, replace keyboard. If mouse does not work in any ADB port, replace mouse. 4. Replace logic board. Retain customer's SIMMs.
Known-good ImageWriter or ImageWriter II will not print	1. Make sure Chooser and Control Panel are set correctly. 2. Replace printer driver and system software with known-good driver and system software. 3. Replace printer interface cable. 4. Replace logic board. Retain customer's SIMMs. 5. Replace power/sweep board.
Known-good LaserWriter will not print	1. Make sure Chooser and Control Panel are set correctly. 2. Replace printer driver and system software with known-good driver and system software. 3. Refer to *Networks* manual in *Service Source*.

Floppy Drive Problems	Solutions
Audio and video present, but internal drive does not operate	1. Replace bad disk. 2. Replace internal disk drive cable. 3. Replace internal disk drive. 4. Replace logic board. Retain customer's SIMMs.
External drive does not operate	1. Replace bad disk. 2. As you face computer screen, be sure external drive is on the right side of the Macintosh. 3. Replace external drive. 4. Replace logic board. Retain customer's SIMMs.

Macintosh Classic II
Symptom/Cure Chart

Will not eject disk	1. Push opened paper clip into hole beside drive to manually eject disk. 2. Power off system and hold mouse button down while powering back on (to complete eject cycle). 3. Replace disk drive.
Disk ejects; display shows icon with blinking "X"	1. Replace disk with known-good system disk. 2. Replace disk drive. 3. Replace logic board. Retain customer's SIMMs.
Unable to insert disk all the way	1. To eject previously inserted disk, push opened paper clip into hole beside drive. 2. Switch off system power and hold mouse button down while switching power back on (to complete eject cycle). 3. Replace disk drive.
Internal disk drive runs continuously	1. Replace bad disk. 2. Replace disk drive cable. 3. Replace disk drive. 4. Replace logic board. Retain customer's SIMMs.

SCSI Problems	**Solutions**
Internal or external hard disk will not operate	1. Verify that SCSI loopback card is not attached. 2. Verify that all three internal hard drive terminators are on HDA circuit board (internal hard drive systems only). 3. Replace hard disk drive cable. 4. Replace hard disk drive. 5. Replace logic board. Retain customer's SIMMs.
Works with internal or external SCSI device but not with both	1. Verify that SCSI device ID switch setting on external device is higher than 0. Also verify that ID switch setting on external SCSI device does not duplicate ID switch setting on any other attached SCSI device. 2. Replace terminator on external SCSI device. 3. Replace SCSI device select cable.

Macintosh Classic II
Symptom/Cure Chart

Miscellaneous Problems	Solutions
Clicking, chirping, or thumping sound	1. Verify that main logic board power cable is connected at J12 on main logic board. 2. Replace power/sweep board. 3. Replace logic board. Retain customer's SIMMs.
No video, no audio, and no drive operation	1. Connect power cord and switch power on. 2. Replace power cord. 3. Replace power/sweep board. 4. Replace logic board. Retain customer's SIMMs.
"Sad Macintosh" icon displays	1. Replace bad floppy disk. 2. Replace optional SIMMs in the two SIMM slots on main logic board. 3. Replace logic board. Retain customer's SIMMs.
Screen displays "Sad Macintosh" icon and black lines; screeching sound	1. Replace optional SIMMs in the two SIMM slots on main logic board. 2. Replace logic board. Retain customer's SIMMs.
Smoke/odor	– Replace power/sweep board.

Macintosh Classic II

Specifications

Microprocessor	MC68030 32-bit internal architecture 16 MHz clock frequency Runs System 7.0.1 or later
Memory	2 MB of RAM, expandable to 4, 6, or 10 MB (100 ns or faster SIMMs) 512K of ROM
Video Display	Built-in 9-inch diagonal, high-resolution, 512-by-342-pixel, bit-mapped monochrome display
Interfaces	Apple Desktop Bus (ADB) port (mini DIN-4) External drive port (DB-19) SCSI port (DB-25) Printer port (mini DIN-8) Modem port (mini DIN-8) Sound-out port (mini phone jack) Sound input port (mini phone jack)
Internal Storage	One 1.4 MB Apple SuperDrive One internal 40 MB (or 80 MB optional) SCSI hard drive
Sound	Sound output: four-voice sound with 8-bit digital/analog conversion using 22-KHz sampling rate Sound input: records sound digitally and permits user to mix an external audio source with computer-generated sound; input source should provide 20-mV amplitutde and 600-Ω input impedance
Clock/Calendar	CMOS custom chip with seven-year battery
Electrical	Line voltage: 100 to 120 VAC Frequency: 50 to 60 Hz, single phase Maximum power: 100 watts

Macintosh Classic II
Memory Upgrade

The Macintosh Classic II main logic board has 2 MB of soldered random-access memory (RAM). You can increase the amount of memory to 4, 6, or 10 MB of RAM by installing additional SIMMs on the main logic board in the two SIMM slots. You must fill both slots with SIMMs of like memory capacity (two 1 MB, two 2 MB, or two 4 MB SIMMs), or leave both slots empty. The Classic II requires 100 ns (or faster) SIMMs. **(Refer to "SIMM Identification" under the General Information tab.)**

Upgrade Procedure

To install a SIMM, hold it by its edges with the contacts on the SIMM pointing down. Insert the SIMM at an angle (bottom forward) into the SIMM slot. Push back on the top corners of the SIMM. You will hear a click when the SIMM snaps into place.

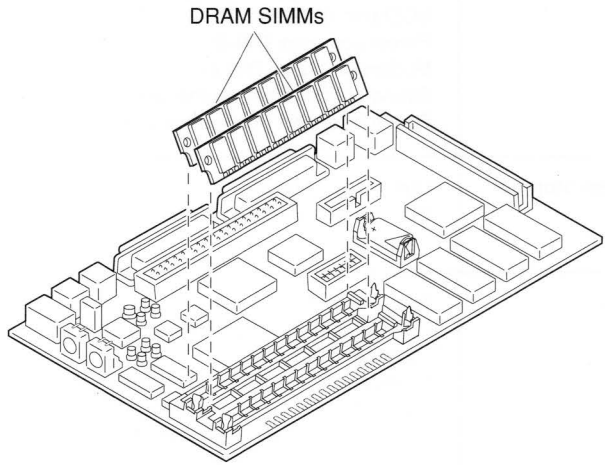


Figure: Classic II Main Logic Board and SIMMs

WARNING: The lithium battery used in the Macintosh Classic II has a potential for explosion or overheating if improperly handled and cannot be recharged. A violent chemical reaction may occur if you attempt to recharge a lithium battery.

Take the following precautions when you store, handle, or dispose of lithium batteries:

- Inspect the integrity of battery wrappers and store the batteries in the same packaging, or in a similar closed, heavy plastic bag.
- Store batteries in a designated, well-marked area with limited access.
- Do not allow the battery leads or terminals to short-circuit.
- Do not dispose of batteries in a fire or incinerator. They may explode.
- Lithium is water reactive. Dispose of lithium compounds as hazardous waste:

Place the dead battery in the air-tight wrapper and packaging that came with the replacement battery. Mark the package DEAD and return it to Apple for proper disposal. Exception: if the battery is physically damaged (for example, leaking), do not return it to Apple; dispose of the battery locally according to your local hazardous waste ordinances.

Replacement Procedure

Remove the main logic board. With the board removed, grasp the old battery and pull it from the battery holder.

When installing a new battery, be sure to use only the correct Apple replacement battery. Orient the new battery so that the end marked "+" matches the "+" on the main logic board. Insert the battery into the battery holder. If the battery holder has a cover, replace the cover. Package the old battery as directed in the introduction to this procedure and return the battery to Apple for proper disposal.

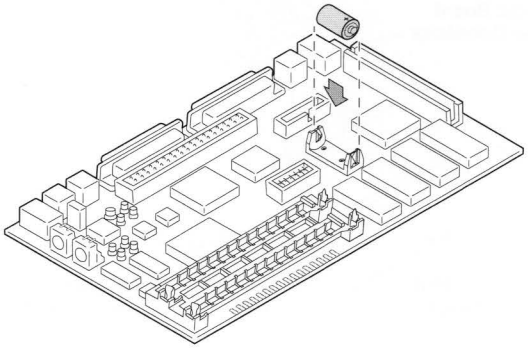


Figure: Battery Replacement

Macintosh Classic II

Classic II Upgrade and Board Diagram

Use the Macintosh Classic II upgrade kit to upgrade a Macintosh Classic to a Classic II. The upgrade kit includes:

- Classic II logic board
- Classic II rear housing
- Microphone
- Accessory kit

Upgrade Procedure

Remove the Macintosh Classic logic board and memory expansion board. Remove all SIMMs from the memory expansion board and return them to the customer.

Install the Classic II main logic board and rear housing provided in the upgrade kit. (The Classic II rear housing provides an opening for the sound input port.) Give the customer the microphone and accessory kit.

> The Macintosh Classic II requires 100 ns or faster SIMMs. If you remove 100 ns or faster 1 MB SIMMs from the Classic memory expansion board, you may install these SIMMs on the Classic II main logic board in the two SIMM slots. Note that you must install two SIMMs of like capacity in the SIMM slots, or both slots must be empty. For more information, refer to the Memory Upgrade procedure earlier in this section.

Board Diagram

The figure below illustrates the internal connectors on the Macintosh Classic II.

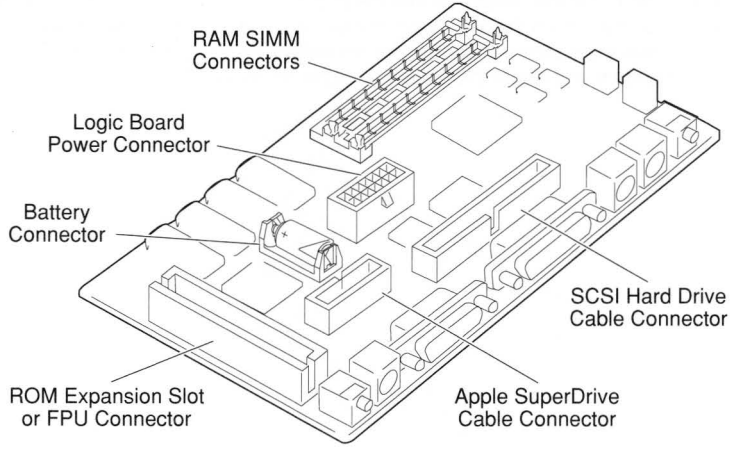
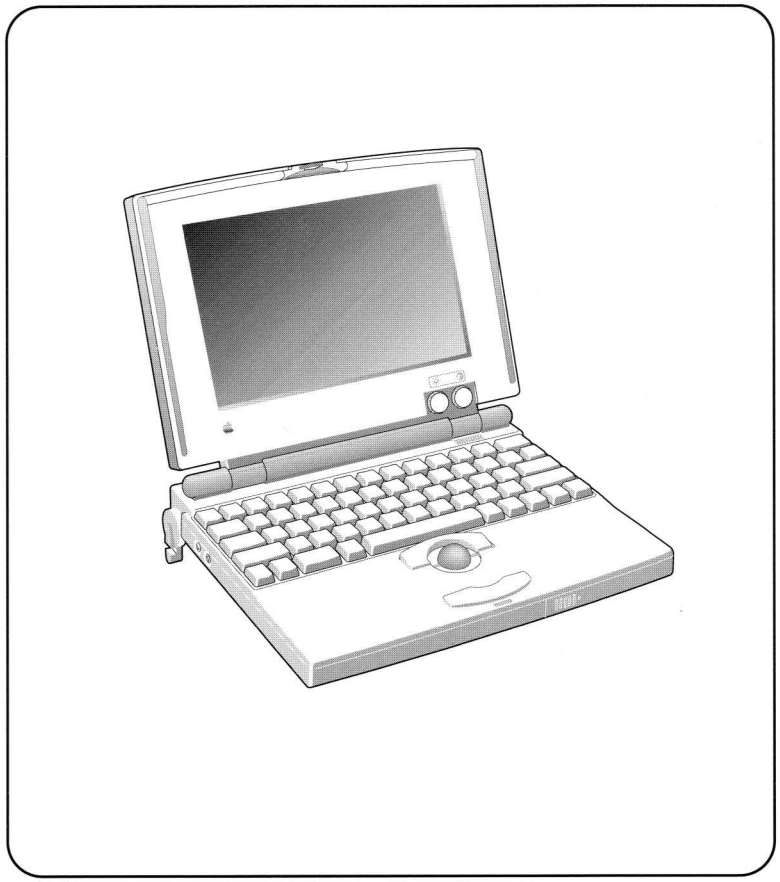


Figure: Board Diagram

Macintosh PowerBook 100

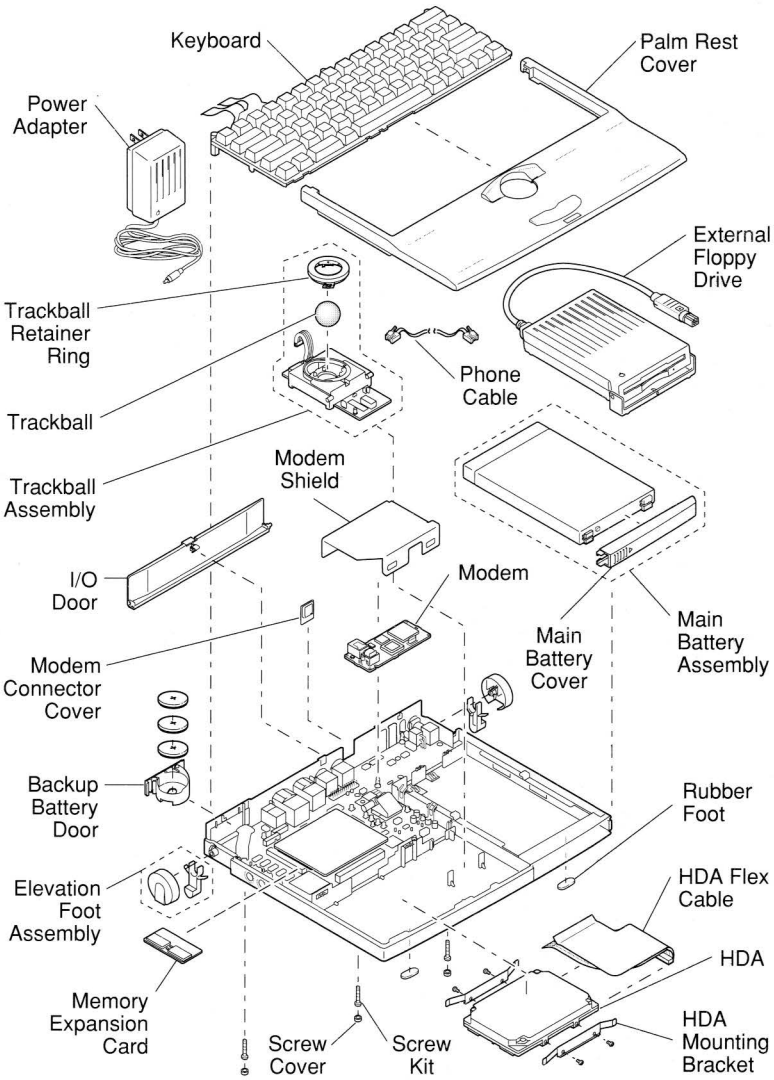
Table of Contents

Contents **Page**



Macintosh PowerBook 100

Exploded View



Macintosh PowerBook 100

Parts List

Backup Battery Door 949-0336
Elevation Foot Assembly (two feet, four pieces) 076-0411
Fax/Data Modem (U.S., Canada, and Japan) 661-1621
- Modem Connector Cover 949-0337
- Modem Shield 949-0364
- U.S. Telephone Cable 590-0590

Floppy Disk Drive
- 1.4 MB Floppy Drive Mechanism, 19 mm 661-1623
- Cable, Flex 821-0655
- Cable, HDI-20, Drive-to-CPU 590-0719
- Cable Interface Board 699-0479
- Case Bottom 603-5121
- Case Top 603-5120
- Door 603-5010
- Door Retainer Pins 603-5011
- Service Packaging 602-0308

HDA, 2.5-Inch, 20 MB, HDI-30 661-1622
HDA, 2.5-Inch, 40 MB, HDI-30 661-1644
- HDA Flex Cable (with shield) 076-0445
- HDA Mounting Bracket 948-0149
- HDA Mounting Bracket (for 40 MB drive) 948-0157
- HDI-30 SCSI System Cable 590-0717
- HDI-30 SCSI Disk Adapter Cable 590-0718
- Service Packaging, HDA, 2.5-Inch Drives 602-0307

Input/Output Door 076-0412
Keyboard 661-0713
Main Battery Assembly 661-0723
Main Battery Cover 949-0365
Memory Expansion Kit, 2 MB 661-0715
Memory Expansion Kit, 4 MB 661-0714
Mouse, Low-Power 661-0585
- Ferrite Bead, Low-Power Mouse 612-5019
- Mouse Ball (21.9 mm diameter) 699-8038
- Retainer, ADB Mouse Ball (38 mm diameter) 076-0231

Palm Rest Cover 076-0414
Power Adapter 699-0517
Rubber Foot (with peel-and-stick adhesive backing) 936-0039
Screw Kit (includes display assembly screws) 076-0557
Screw Cover, Bottom Cover 956-0030
Trackball Assembly 661-0676
- Trackball Ball 949-0335
- Trackball Retainer Ring 949-0334

Note: *Sony and other battery manufacturers sell the backup batteries under the industry standard number CR-4230.*

Before You Start

- Check the battery and power adapter.

  Note: *The parameter RAM battery does not support system RAM. Save RAM contents before removing the main battery.*

CAUTION: The power adapters on the Macintosh Portable and the PowerBook computers are not interchangeable. You will damage the computer if you try to use the power adapters interchangeably.

- Check connections on internal and external cabling and on option cards.
- If the correct version of system software is not present, install it and verify the failure. Use system software 7.0.1 or later.
- Remove all option cards and disconnect external devices (printers, SCSI devices, additional ADB devices, and disk drives).
- Test the internal cables with known-good systems.

Things to Remember

- When running the *Hard Disk Test* diagnostic to test the hard disk, operate the computer from the power adapter and do not select looping.
- Follow all electrostatic discharge precautions when working on the PowerBook 100. The computer is **very sensitive to ESD.** Refer to the *You Oughta Know* tab in *Apple Service Technical Procedures* for additional information.
- When you attach the power adapter to the computer but do not plug the computer into a power source, a low-power dialog box appears .
- The PowerBook computers do not provide termination power. Terminate the first and last SCSI devices as in the table below.

	1 External SCSI Device	>1 External SCSI Device
PowerBook Without Internal Hard Drive	2 terminators, both on external device	1 terminator on 1st external device 1 terminator on last external device
PowerBook With Internal Hard Drive	1 terminator on external device	1 terminator on 1st external device 1 terminator on last external device

- The battery desk accessory is a general indicator of the battery charge level. Use a voltmeter to determine the actual charge.

Battery Verification

1. Disconnect the power adapter.

   Note: *Save RAM contents before removing the main battery. Otherwise, contents will be lost.*

WARNING: Do not short the battery. The battery may become hot enough to burn you.

2. Remove the main battery.
3. Set the voltmeter range to 10 volts DC.
4. Touch and hold the **positive probe** of the voltmeter to the **positive side** of the battery.
5. Touch and hold the **negative probe** of the voltmeter to the **negative side** of the battery.
6. The reading for a good battery should be **above 5.7 volts**. If the battery falls below 5.7 volts, recharge the battery. If the battery will not recharge, replace it.

Adapter Verification

1. Plug the power adapter into the wall source.
2. Set the voltmeter range to 10 volts DC.
3. Touch and hold the **positive probe** of the voltmeter to the **inside** of the adapter plug.
4. Touch and hold the **negative probe** of the voltmeter to the **outside** of the adapter plug.
5. The reading for a good adapter should be **7.5–7.9 volts**. If the voltage is not in this range, replace the adapter.

CAUTION: The power adapters on the Macintosh Portable and the PowerBook computers are not interchangeable. You will damage the computer if you try to use the power adapters interchangeably.

Macintosh PowerBook 100
Symptom/Cure Chart

Power Problems	Solutions
Screen is blank; computer does not respond	1. Verify that storage switch is in the *on* position. 2. Reset computer. 3. Connect AC adapter and restart computer in 3-4 minutes. 4. Install known-good, charged main battery. If computer now works, replace main battery. 5. Verify that keyboard cable is connected securely. 6. Replace keyboard. 7. Return computer to Apple.
After changing main battery, some Control Panel settings are different	– Replace backup batteries.
After removing all power sources, some Control Panel settings are different	– This condition is normal. If you disconnect AC adapter and remove main and backup batteries, you remove all power to computer. Removing all power affects some Control Panel settings (such as time) in parameter RAM.
AC adapter is plugged in and connected, but battery DA does not indicate charger is connected	1. Verify that AC adapter is connected properly. 2. Try a known-good main battery. If battery now charges, replace main battery. 3. Verify adapter is good. 4. Replace AC adapter. 5. Return computer to Apple.
Low-power warning appears soon after starting computer	1. Battery needs recharging. Attach power adapter. 2. Make sure peripherals display low-power icon. 3. Extensive use of floppy or hard drives, modem, sound, backlight, or other power-consuming devices can produce low-power warning. Reduce use of these devices or connect AC adapter.
Computer runs when plugged into wall outlet, but does not run off battery; battery voltage is OK	– Fuse on motherboard may be blown. Return computer to Apple.

Video Problems	Solutions
Screen suddenly goes blank	– Computer has gone into system sleep to conserve battery power.

Macintosh PowerBook 100

Symptom/Cure Chart

Screen goes blank and computer shuts down every few minutes	– Computer is going into system sleep to conserve battery power. If computer is going into system sleep too often, adjust sleep delays in Control Panel or connect AC adapter.
Pixel never comes on	– If more than five pixels do not come on, return computer to Apple.
Pixel is always switched on	– Return computer to Apple.
Row of pixels never comes on	– Return computer to Apple.
Partial or entire row of pixels is always on	– Return computer to Apple.
Very slight white line is always in middle of screen	– This is normal for PowerBook 100 FSTN screen.
Display is very light or all white	1. Adjust screen contrast and brightness settings. 2. Check interconnect cable connection to motherboard. 3. Return computer to Apple.
No display, but computer appears to operate correctly	1. Adjust screen contrast and brightness settings. 2. Check interconnect cable connection to motherboard. 3. Return computer to Apple.
Display shows rainbow colors from extreme viewing angles	– This effect is normal for PowerBook 100 FSTN screen.
Image is not uniform	– This effect is normal for PowerBook 100 FSTN screen.
Display stopped working (or dimmed) but shows no problems now	– If temperature or light was extreme during problem time (under 5° C or over 45° C), operation is normal for PowerBook 100 FSTN screen.
Backlight doesn't operate	1. Adjust screen brightness setting. 2. Check interconnect cable connection to motherboard. 3. Return computer to Apple.

SCSI Hard Disk Drive Problems	Solutions
Internal hard disk does not operate	1. Verify that all external SCSI devices connected to computer are switched on. 2. Verify that internal SCSI hard drive cable is securely connected at both ends. 3. Use HD SC Setup (which is supplied with system software) to see whether drive is visible to program. If it is visible, update SCSI driver. 4. Reinstall system software. 5. Replace HDA flex cable that connects hard disk assembly to motherboard. 6. Replace hard disk assembly. 7. Return computer to Apple.
Hard disk is slow to respond, or screen goes blank too often	– Computer powers down the hard disk or goes into system sleep to conserve battery power. Adjust sleep delays in Control Panel or connect AC adapter.

Peripheral Problems	Solutions
After connecting an external SCSI device, computer no longer boots	1. Switch on external SCSI device before starting computer. 2. Verify that an Apple HDI-30 SCSI System Cable is connected between PowerBook computer and external SCSI device. 3. Verify that cable termination is correct. 4. Verify that no SCSI devices have the same device address. 5. Return computer to Apple.
Cursor does not move when you move trackball	1. Reset computer. 2. Check cable connection between trackball assembly and motherboard. 3. Replace trackball assembly. 4. Return computer to Apple.
Cursor intermittently does not move or moves erratically	1. Clean trackball ball and internal rollers. 2. Replace trackball assembly.
Cursor does not move when you move mouse.	1. Check mouse connection to ADB port. 2. Reset computer. 3. Clean mouse ball and inside of mouse. 4. Replace mouse. 5. Return computer to Apple.

Cursor moves, but clicking button has no effect	1. Check cable connection between trackball and motherboard. 2. Replace trackball assembly. 3. Return computer to Apple.
No response to any key on keyboard	1. Reset computer. 2. Connect AC adapter and restart computer in 3-4 minutes. 3. Install known-good, charged main battery. If computer now works, replace main battery. 4. Verify that keyboard cable is securely connected to motherboard. 5. Replace keyboard. 6. Return computer to Apple.
Known-good ImageWriter, ImageWriter II, or LQ does not print	1. Make sure system software is 7.0.1 or later. 2. Make sure Chooser is set correctly. 3. Verify that printer cable is attached securely. 4. Replace printer cable. 5. Return computer to Apple.
Known-good LaserWriter does not print	1. Make sure system software is 7.0.1 or later. 2. Make sure Chooser setting is correct. 3. Verify that all printer cabling is attached securely. 4. Try another printer. If that printer works, computer is OK. Refer to *Networks* tab manual on *Service Source* for further assistance. 5. Return computer to Apple.
Serial devices are unrecognized or garbage is transmitted and/or received	1. Make sure system software is 7.0.1 or later. 2. Verify that cabling is correct type and securely attached. 3. Attach device(s) in chain to known-good computer. 4. Return computer to Apple.

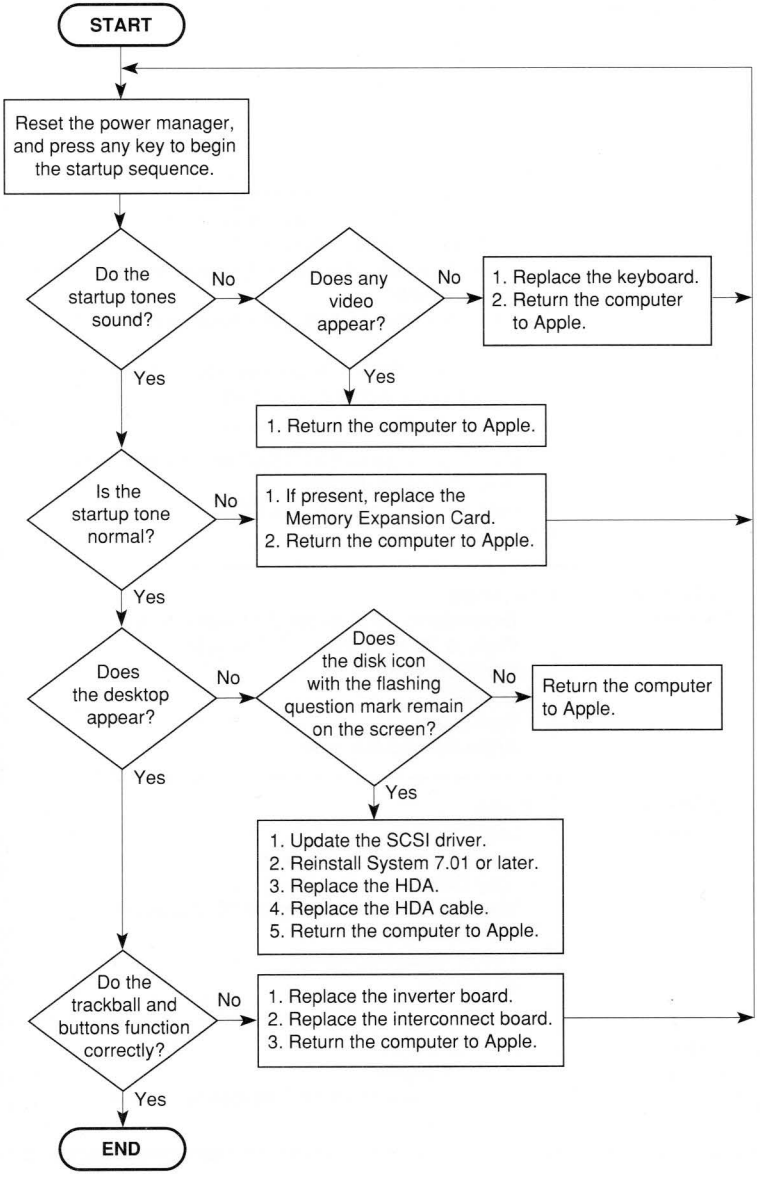
Internal Modem Problems	**Solutions**
Internal modem options do not appear in Control Panel window, but modem is installed	1. Reseat modem card. 2. Replace modem card. 3. Return computer to Apple.
Modem connects but does not communicate with remote modem	– Verify that remote modem needs error correction. If remote modem does not need error correction, disable error correction by typing **&Q0** (see the *Macintosh PowerBook Fax/Data Modem User's Guide*).

Modem interferes with system sound	1. Replace modem card. 2. Return computer to Apple.
Modem has no sound output	– Replace modem card.
A strange mix of characters appears on screen	1. Verify that baud rate and data format settings of communications application are compatible with internal modem and remote modem. 2. Verify telephone cord is securely attached and working properly. 3. Replace modem card.
Modem does not respond properly to AT command set instructions	1. Verify that baud and data format settings of communications application are compatible with internal modem and remote modem. 2. Verify that telephone cord is attached securely and working properly. 3. Verify that phone line produces dial tone. 4. Replace modem card.

Miscellaneous Problems	**Solutions**
Some applications seem to run slower after a few seconds	– PowerBook is switching to system rest. If system rest is interfering with operation of application, connect AC adapter.
No sound from speaker	1. Set volume (in Control Panel) to 1 or above. 2. Check speaker connection to motherboard. 3. Return computer to Apple.

Macintosh PowerBook 100

Troubleshooting - Startup Problems



Macintosh PowerBook 100
Specifications

Microprocessor	Type: MC68HC000, 16-bit CMOS Clock speed: 15.6672 MHz Addressing: 32-bit internal registers 24-bit address bus 16-bit data bus
Memory	Standard RAM: 128 bytes of system parameter RAM 32K of pseudostatic video display memory 2 MB pseudostatic RAM (four 512K x 8-bit chips; 100 ns access time; addressing supports 8 MB max) Expansion RAM: Optional 2 MB and 4 MB RAM expansion cards ROM: 256K (two 128K x 8-bit devices; 150 ns access time; addressing supports up to 4 MB)
Display	Type: Film-compensated SuperTwist Nematic (FSTN) backlit flat-panel display Resolution: 640 x 400 pixels, 75 dpi Size: 9" diagonal
I/O Devices (Standard)	Keyboard: Dimensions: 10.6" length, 3.5" width, .5" depth Pitch: 0.73" horizontal, 0.71" vertical Interface: ADB Trackball: Dual-button Apple Desktop Bus interface
I/O Devices (Optional)	Mouse: Low-power Apple Desktop Bus interface Floppy Disk Drive: Macintosh HDI-20 external 1.4 MB floppy drive 4.5 W startup power 1.25 W random operation 50 mW idle
Floppy Disk Interface	Apple SWIM chip MFM/GCR modes Supports the Macintosh HDI-20 external 1.4 MB floppy drive

20 MB Hard Drive	20 MB formatted capacity Apple SCSI interface 2.5-inch mechanism 23 msec average access time (max.) 5.0 W startup power 2.7 W random operation 1.5 W idle
40 MB Hard Drive	40 MB formatted capacity Apple SCSI interface 2.5-inch mechanism <19 msec average access time (max.) 5.0 W startup power 2.25–2.5 W random operation 1.3–1.5 W idle
SCSI Interface	HDI-30 SCSI connector 7.5 MB/second transfer rate Supports a maximum of five devices (Computer is device 3; SCSI hard drive is device 0.) Requires Apple HDI-30 SCSI System Cable for connecting exernal devices Requires Apple HDI-30 SCSI Adapter Cable for connecting to another computer Termination power is not suplied (see the table in "Troubleshooting – Introduction" for termination information)
Apple Desktop Bus	Low-speed serial interface
Serial Interfaces	Two RS-422 ports, one external and one internal 230.4 Kbaud minimum Asynchronous, synchronous, and AppleTalk protocols supported Internal connector supports Macintosh PowerBook Fax/Data modem
Mono Audio	Mono-to-stereo conversion at port; plays left-channel sound on both output channels Output impedance of 8 to 600 ohms Short-circuit protected Disables internal speaker when in use

Macintosh PowerBook 100

Specifications

Main Battery	Type: Sealed lead-acid Voltage: 7.0 volts Capacity: 2.5 hours max.
Backup Batteries	Three 3.5-V lithium cells Industry standard CR-4230 batteries
Power Adapter	AC input voltage: 85–270 VAC (100/240 nominal) 48–62 Hz (50/60 nominal) Output voltages: 7.0–7.6 volts (7.5 nominal) 5 milliamps–2.0 amps (1.5 nominal)
Sound	Apple Sound Chip 1- or 4-voice mono (1 or 2 voices in stereo) with 4-bit digital-to-analog conversion using a 22 KHz sampling rate Filtered by one Sony sound chip
Modem	Operating Modes: Auto or manual dial Auto or manual answer Protocol: Serial binary and asynchronous Character Length: 7 or 8 bits; 1 or 2 stop bits Parity: Odd, even, mark, space, or no parity Data Transmission Mode: Full Duplex, Asynchronous Transmission Rate: 110–300 bps Bell 103 1200 bps Bell 212A 1200 bps CCITT V.22 2400 bps CCITT V.22bis 110/300 bps CCITT V.21 1200/75 bps CCITT V.23 (Int.) Data Compression: MNP Class 5, CCITT V.42bis Error Control: MNP Class 4, CCITT V.42 Fax Compatibility: Group 3 Transmission Speeds: 2400 bps, 1200 bps, 300 bps Fax Transmission Mode: Half-Duplex Fax Transmission Rate: 2400/4800 bps CCITT V.27 7200/9600 bps CCITT V.29

Installation Procedure

1. Disconnect the AC adapter and remove the backup batteries, main battery, display assembly, keyboard, and palm rest cover.

2. Install the RAM expansion card (**see Figure**).

3. Replace the palm rest cover, keyboard, display assembly, main battery, and backup batteries.

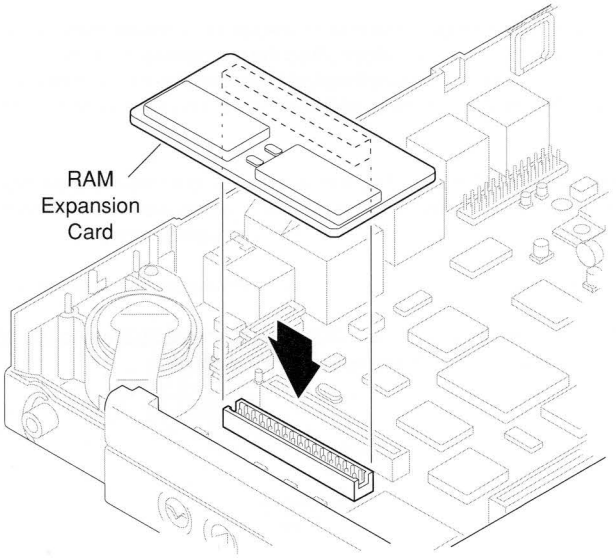


Figure: Macintosh PowerBook Memory Expansion

Installation Verification

1. Switch on the computer.

2. Pull down the Apple menu and select **About the Finder**.

3. Verify that the amount of RAM (**Total Memory**) is 4,096K (2 MB RAM Expansion Card) or 6,144K (4 MB RAM Expansion Card). If the amount of RAM is not correct, replace the RAM card. If replacing the RAM card does not solve the problem, return the computer to Apple.

Note: *Eight MB is the maximum RAM upgrade for the PowerBook 100. A 6 MB RAM expansion card is necessary for the maximum upgrade.*

Installation Procedure

1. Disconnect the AC adapter and remove the backup batteries, main battery, display assembly, and keyboard.

2. Locate the metal prongs that retain the modem shield (**see Figure**). Push the metal prongs toward the back of the computer until you can lift the modem shield up and out of the bottom cover.

3. Locate the modem connector cover and lift it up and out of the bottom cover.

4. Position the fax/data modem so that connector J1 on the fax/data modem faces down and directly above connector J9 on the motherboard. Verify that the holes in the fax/data modem align with the plastic standoffs on the motherboard. Press down on the fax/data modem until the board locks in place on the plastic standoffs.

5. Replace the modem shield. The tabs that mount over the metal prongs belong between the metal prongs and the rear wall of the main battery cavity. The modem shield should not extend into the main battery cavity.

6. Replace the keyboard, display assembly, main battery, and backup batteries.

7. Peel the backing off the FCC and DOC labels and apply them to the left of the modem connector on the back panel of the computer.

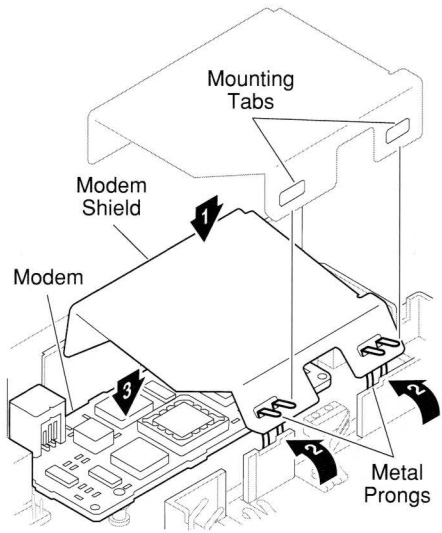


Figure: Internal Modem Installation

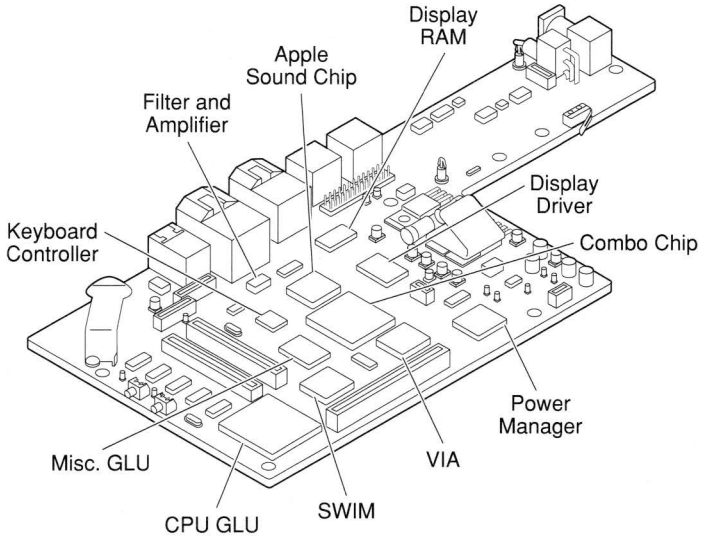


Figure: Macintosh PowerBook 100 Motherboard

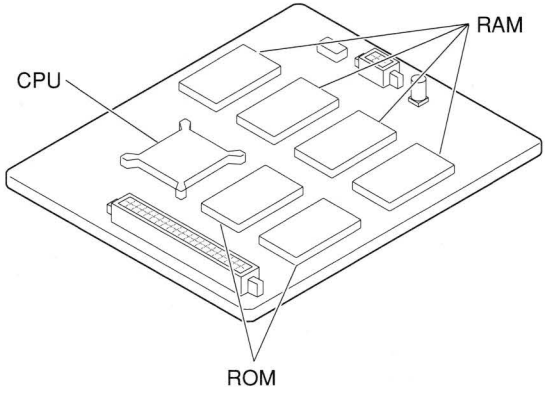


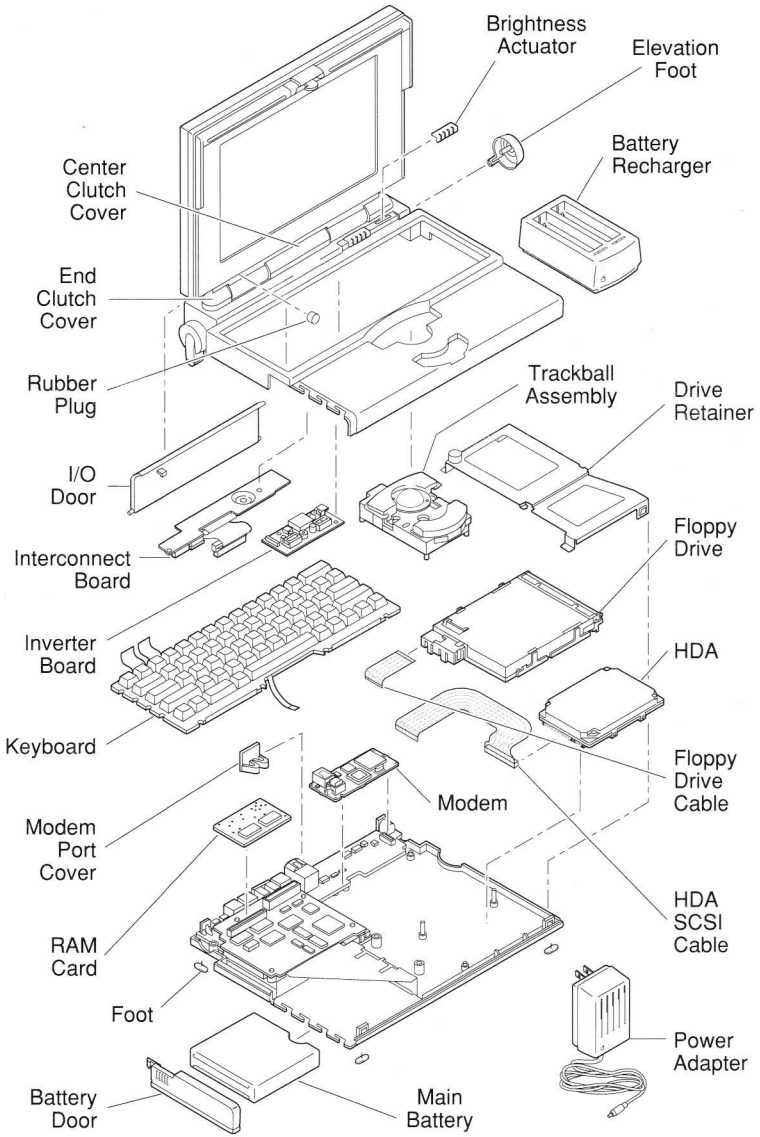
Figure: Macintosh PowerBook 100 Daughterboard

PowerBook 140/170

Table of Contents

Contents **Page**

Exploded View—PowerBook 140/170



Drive Retainer, 17-mm-High	805-0412
Drive Retainer, 19-mm-High	805-0414
Elevation Foot, Left	815-1278
Elevation Foot, Right	815-1237
Elevation Foot Spring Clip	805-0400
Elevation Foot Washer	815-1266
Foot	815-1236
Inverter Board, Active Matrix (green)	699-0273
Inverter Board, FSTN (blue)	699-0271
Inverter Board, FSTN (red)	699-0272
Inverter Shield (PowerBook 140, pkg. of 5)	076-0588
Inverter Shield (PowerBook 170, pkg. of 5)	076-0587
Interconnect Board	661-0724
HDA, 2.5-Inch, 20 MB, HDI-30	661-1622
HDA, 2.5-Inch, 40 MB, HDI-30	661-1630
Internal HDA SCSI Cable	630-0534
HDI-30 SCSI System Cable	590-0717
Packaging, 2.5-Inch, SCSI HDA	602-0307
I/O Door	815-1233
Keyboard, Domestic	661-0712
Main Battery	661-0721
Battery Door	815-1240
Battery Recharger	076-0567
Microphone Assembly	658-0303
Modem Board, 2400 Baud, Domestic (optional on PowerBook 140)	661-1621
Modem Port Cover	815-0578
Modem Screw Kit (PowerBook 140)	076-0575
Power Adapter, Domestic	699-0517
RAM Card, 2 MB (Optional)	661-0715
RAM Card, 4 MB (Optional)	661-0714
Top Case, Misc. Parts	
Brightness Actuator (PowerBook 140)	815-1248
Brightness Actuator (PowerBook 170)	815-1305
Center Clutch Cover	815-1230
Contrast Actuator (PowerBook 140)	815-1247
End Clutch Cover	815-1231
Rubber Plug	875-0112
Trackball Assembly	661-0710
Trackball Ball	949-0362
Trackball Retainer	949-0363

PowerBook 140/170
Specifications

Microprocessor	MC68030, 32-bit internal architecture Clock speed: PowerBook 140 – 16 MHz PowerBook 170 – 25 MHz
Memory	System RAM: PowerBook 140 – 2 MB, four 4-megabit 512K x 8-bit PSRAM chips (on daughterboard) PowerBook 170 – 4 MB, eight 4-megabit 512K x 8-bit PSRAM chips (2 MB on daughterboard, 2 MB on RAM expansion card) Other RAM: 256 bytes of system parameter memory 256 K of static video display memory ROM: 1 MB, two 256 K x 16-bit devices; 150 nsec access time (addressing supports up to 4 MB)
PowerBook 140 Display	Type: Film-compensated Supertwist Nematic (FSTN) backlit flat-panel display Speed: 250 ms Brightness: 50 nits minimum, user controllable Contrast: 12:1, user controllable Resolution: 640 x 400 pixels, 75 dpi Power: .45 W display, 3 W inverter
PowerBook 170 Display	Type: Transmissive, active-matrix liquid crystal backlit flat-panel display Speed: 50 ms Brightness: 60 nits minimum, user controllable Contrast: 15:1, factory set Resolution: 640 x 400 pixels, 75 dpi Power: .45 W display, 3 W inverter
Keyboard	Dimensions: 10.6" length; 3.5" width, .5" depth Pitch: .73" horizontal; .71" vertical Interface: Matrix
Trackball	Apple Desktop Bus interface

Floppy Drive	19-mm-high, 1.4 MB high-density floppy disk drive 4.5 W startup power 1.25 W random operation 50 mW idle
20 MB Hard Drive	20 MB formatted capacity Apple SCSI interface 2.5-inch mechanism 5.0 W startup power 2.7 W random operation 1.5 W idle
40 MB Hard Drive	40 MB formatted capacity Apple SCSI interface 2.5-inch mechanism 5.0-5.55 W startup power 2.25-3.5 W random operation 1.3-2.0 W idle
Disk Interface	Apple SWIM chip MFM/GCR modes Supports Macintosh 1.4 MB floppy drive and Apple 800K floppy drive
SCSI Interface	HDI-30 SCSI connector HDI-30 SCSI system cable 1.5 MB/second transfer rate Supports a maximum of five external devices (The internal SCSI hard disk drive is device 0.) Termination power is not supplied. Terminate the SCSI chain as shown under Troubleshooting—Introduction. Use Apple's standard terminator (not the Macintosh IIfx terminator)
Serial Interfaces	Two RS-422 ports 230.4 K baud maximum 0.920 Mbit/second if external clock source (modem interface only) Supports asynchronous, synchronous, and AppleTalk protocols Internal connector supports the Macintosh PowerBook Fax/Data Modem

Main Battery	Type: NiCad (nickel cadmium) Size: 3.94" x 3.94" x .8" Weight: .83 lbs Voltage: 5.65–7.2 V (6.0 nominal) Capacity: 2.5–3 amp-hours (fully charged battery; actual time depends on system configuration and power management settings) Recharge Time: 3 hrs (CPU off) Power Cycles: 500
Parameter RAM Battery	3-volt lithium, rechargeable
Power Adapter	AC input voltage: 110–240 VAC Output voltages: 7–10 V (7.8 nominal) 2.0 amps
Battery Recharger (Optional)	Input voltage: 7.8 VDC Input current: 2.0 amps (max.)
Apple Desktop Bus	Low-speed serial interface Maximum current draw for all ADB devices is 200 mA
General Information	Dialog boxes: First Dialog 5.9 V Second Dialog 5.75 V 10 Sec. Warning 5.65 V Shutdown 5.55 V System Usage: Sleep 5–6 mA Shutdown 300 µA Backlight max, HDA spin 940–960 mA Backlight min, HDA spin 690–720 mA Backlight max, HDA off 670–700 mA Backlight min, HDA off 430–450 mA

Sound	Enhanced Apple Sound Chip 1 voice in mono and stereo with 8-bit digital-to-analog conversion using a 22 KHz sampling rate Filtered by the digitally filtered audio chip (DFAC) Stereo-compatible (monaural input, stereo output) Output impedance of 8 to 600 ohms Short-circuit protected Speaker: Size: .78" x .39" x .12" Impedance: 8 ohms at 1 KHz Maximum Power: .2 W Harmonic Frequency: 640 Hz Frequency Range: 640 Hz to 3 KHz Sound Power Level: 79 dB +3 dB
Modem	Operating Modes: Auto or manual dial Auto or manual answer Protocol: Serial binary and asynchronous Character Length: 7 or 8 bits; 1 or 2 stop bits Parity: Odd, even, mark, space, or no parity Data Transmission Mode: Full Duplex Asynchronous Transmission Rate: 110–300 bps Bell 103 1200 bps Bell 212A 1200 bps CCITT V.22 2400 bps CCITT V.22bis 110/300 bps CCITT V.21 1200/75 bps CCITT V.23 (Int.) Data Compression: MNP Class 5 CCITT V.42bis Error Control: MNP Class 4 CCITT V.42 Fax Compatibility: Group 3 Transmission Speeds: 2400 bps, 1200 bps, 300 bps Fax Transmission Mode: Half Duplex Fax Transmission Rate: 2400/4800 bps CCITT V.27ter 7200/9600 bps CCITT V.29

Pressing the reset switch resets the power manager and the central processor and reboots the computer; information in system RAM disappears. Pressing the interrupt switch creates a system interrupt. Pressing the power button switches the computer on or wakes it from sleep. The table below summarizes the computer power states and the reset switch, interrupt switch, and power button functions.

Power States

Starting Power State	Action	Computer Response
Power off	Press power button	Boot
Power off	Press any key	Power off (no change)
Power off	Insert charger	Charging
Power on	Issue shutdown command	Data saved, power off
Power on	Press power button	Data lost, power off
Power on	Press power button twice	Data lost, reboot
Power on	Press reset switch	Data lost, reboot
Power on	Press interrupt switch	Test monitor mode
Power on	Press both reset & interrupt	Data lost, reboot
Power on	Issue sleep command	Sleep
Sleep	Press any key (except <Caps Lock>)	Power on
Sleep	Press power button	Power on
Sleep	Detect very low power	Data lost, power off
Sleep	Remove battery	Data lost, power off

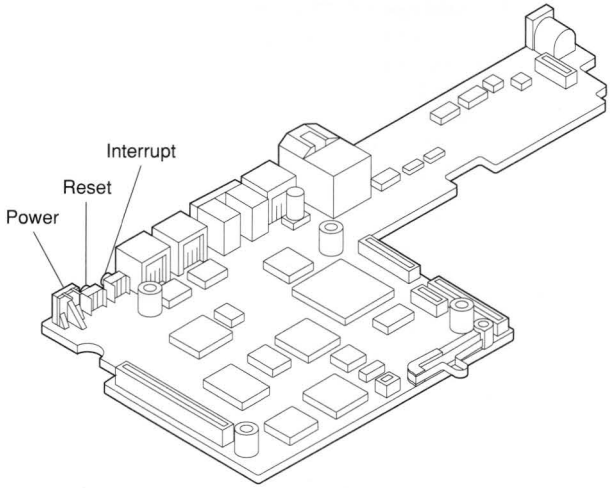


Figure: Reset Switch, Interrupt Switch, and Power Button

Before You Start

- Check the battery and power adapter. Note that the parameter RAM battery does not support system RAM. Save RAM contents before removing the main battery.

CAUTION: The power adapters on the Macintosh Portable and the PowerBook computers are not interchangeable. You will damage the computer if you try to use the power adapters interchangeably.

- Check connections on internal and external cabling and on option cards.
- If the correct version of system software is not present, install it and verify the failure. Use system software 7.0.1 or later.
- Remove all option cards and disconnect external devices (printers, SCSI devices, additional ADB devices, and disk drives).
- Test the internal cables with known-good systems.

Things to Remember

- Install inverter shields on all PowerBook 140/170 computers.
- When running the *Hard Disk Test* diagnostic to test the hard disk, operate the computer from the power adapter and do not select looping.
- Follow all electrostatic discharge precautions when working on the PowerBook 140/170. The computers are **very sensitive to ESD.** Refer to Safety Information in *Service Source* for additional information.
- When you attach the power adapter to the computer but do not plug the computer into a power source, a low-power dialog box appears .
- The battery desk accessory is a general indicator of the battery charge. Use a voltmeter to determine the actual charge.
- The PowerBook computers do not provide termination power. Terminate the SCSI chain as shown in the table below.

	1 External SCSI Device	>1 External SCSI Device
PowerBook Without Internal Hard Drive	2 terminators, both on external device	1 terminator on first external device 1 terminator on last external device
PowerBook With Internal Hard Drive	1 terminator on external device	1 terminator on first external device 1 terminator on last external device

Battery Verification

1. Disconnect the power adapter. Note that the parameter RAM battery does not support system RAM. Save RAM contents before removing the main battery.

WARNING: Do not short the battery. The battery may become hot enough to burn you.

2. Remove the main battery.
3. Set the voltmeter range to 10 volts DC.
4. Touch and hold the **positive probe** of the voltmeter to the **positive side** of the battery.
5. Touch and hold the **negative probe** of the voltmeter to the **negative side** of the battery.
6. The reading for a good battery should be **above 5.7 volts**. If the battery falls below 5.7 volts, recharge the battery. If the battery will not recharge, replace it.

Adapter Verification

1. Plug the power adapter into the wall source.
2. Set the voltmeter range to 10 volts DC.
3. Touch and hold the **positive probe** of the voltmeter to the **inside** of the adapter plug.
4. Touch and hold the **negative probe** of the voltmeter to the **outside** of the adapter plug.
5. The reading for a good adapter should be **7.5-7.9 volts**. If the voltage is not in this range, replace the adapter.

CAUTION: The power adapters on the Macintosh Portable and the PowerBook computers are not interchangeable. You will damage the computers if you try to use the power adapters interchangeably.

PowerBook 140/170
Troubleshooting—Symptom/Cure Chart

Startup Problems	Solutions
Computer gives startup chord followed by two-part (eight-tone) error chord sequence	1. Replace RAM expansion card. 2. Return computer to Apple.
Computer gives startup chord, pauses, and then plays four-tone error chord sequence	1. Disconnect hard drive SCSI cable and reboot. If startup chord is normal, replace hard drive. 2. Disconnect floppy drive cable and reboot. If startup chord is normal, replace floppy drive. 3. If error chords still sound, return computer to Apple.

Power Problems	Solutions
Screen is blank; computer doesn't respond	1. Reset power manager. 2. Connect power adapter and try computer again in three or four minutes. 3. Try known-good, charged main battery. If computer now works, replace main battery. 4. Verify that interconnect board, daughterboard, and motherboard connections are secure. 5. If computer is in sleep mode, replace keyboard. 6. Replace interconnect board. 7. Return computer to Apple.
After removing main battery, some Control Panel settings are different	1. Replace interconnect board. 2. Return computer to Apple.
Computer runs when plugged into wall outlet, but does not function when draws from battery. Battery voltage is within tolerance.	– Return computer to Apple.
Power adapter is plugged in and connected, but battery DA does not indicate charger is connected	1. Verify that charger is connected properly. 2. Try known-good main battery. If battery now charges, replace main battery. 3. Try known-good adapter. If battery now charges, replace power adapter. 4. Verify that battery thermistor cable connection is secure. 5. Return computer to Apple.

continued...

PowerBook 140/170
Troubleshooting—Symptom/Cure Chart

Power Problems (continued)	Solutions
A low-power warning appears soon after starting to use computer	1. Battery needs recharging. Attach power adapter. 2. Make sure peripherals are low-power type. 3. Reduce use of floppy or hard disk, modem, sound, backlight, or other power-consuming devices, or connect power adapter. 4. Verify that battery is good. 5. Verify that power adapter is good.

Video Problems	Solutions
Pixel never comes on/is always on	– If more than five pixels do not come on or are always on, return computer to Apple.
A row of pixels never comes on	1. Replace interconnect board. 2. Return computer to Apple.
Slight white line is always in middle of screen	– This is normal for the FSTN screen in PowerBook 140. If screen is active-matrix (PowerBook 170), return computer to Apple.
Partial or complete row of pixels is always on	1. Replace interconnect board. 2. Return computer to Apple.
Screen flickers	– Return computer to Apple.
Display is very light or totally white	1. Adjust screen contrast setting (PowerBook 140). 2. Verify that display cable, inverter board, interconnect board, daughterboard, and motherboard connections are secure. 3. Replace inverter board. 4. Replace interconnect board. 5. Return computer to Apple.
No display, but computer appears to be operating correctly	1. Adjust screen contrast setting (PowerBook 140) and brightness setting. 2. Check inverter board, interconnect board, and daughterboard connections. 3. Replace inverter board. 4. Replace interconnect board. 5. Return computer to Apple.
Image on display is not uniform	– This effect is normal for the FSTN screen in PowerBook 140. Diminish the effect by adjusting contrast and brightness. If screen is active-matrix (PowerBook 170), return computer to Apple.

Display stopped working (or dimmed) but shows no problems now	– If temperature is under 5° C or over 40° C, such reaction is normal for FSTN screen in PowerBook 140.
Backlight doesn't operate	1. Check display cable, inverter board, interconnect board, and daughterboard connections; check that none of the cables is pinched or severed. 2. Replace inverter board. 3. Replace interconnect board. 4. Return computer to Apple.

Floppy Drive Problems	**Solutions**
Audio and video present, but internal drive does not operate	1. Try known-good floppy disk. 2. Check floppy drive cable connection. If it's secure, return computer to Apple.
Disk ejects while booting; display shows Mac icon with blinking "X"	1. Try known-good system disk. 2. Check that trackball or mouse button is working. 3. Check floppy drive cable connection. If it's secure, return computer to Apple.
Disk will not eject	1. Shut down computer, press and hold trackball or mouse button, and switch on computer. 2. Eject disk manually by pushing opened paper clip into hole under floppy drive slot. 3. Check floppy drive cable connection. If it's secure, return computer to Apple.
Disk initialization fails	1. Verify that you are using the proper type of media. 2. Try a known-good disk. 3. Install an inverter shield. 4. Check floppy drive cable connection. If it's secure, return computer to Apple.

SCSI Hard Drive Problems	**Solutions**
Internal hard drive will not operate	1. Disconnect all external SCSI devices. 2. Verify that internal SCSI hard drive cable is securely connected at both ends. 3. Use HD SC Setup to determine whether computer recognizes drive. If it does, try to reinitialize drive. 4. Replace internal SCSI hard drive cable. 5. Replace hard drive. 6. Return computer to Apple.

Peripheral Problems	Solutions
After connecting external SCSI device, computer no longer boots	1. Switch on external SCSI device before starting computer. 2. Verify that external device is connected properly. 3. Verify that SCSI cable is terminated properly. 4. Verify that no two SCSI devices have same device address. 5. Verify that internal hard drive is good. 6. Use a known-good device to verify external SCSI devices. 7. Return computer to Apple.
Cursor does not move when using trackball	1. Press reset switch. 2. Check cable connections between trackball and keyboard, keyboard and interconnect board, and interconnect board and daughterboard. 3. Connect a low-power mouse and try to move curser. If curser moves, try using trackball and keyboard. 4. If trackball does not move curser, replace trackball. 5. If keyboard does not move curser, replace keyboard. 6. Replace interconnect board. 7. Return computer to Apple.
Cursor intermittently does not move or moves erratically	1. Clean ball and internal rollers of trackball. 2. Replace trackball. 3. Replace keyboard. 4. Replace interconnect board. 5. Return computer to Apple.
Cursor moves, but clicking trackball button has no effect	1. Check cable connections between trackball and keyboard, keyboard and interconnect board, and interconnect board and daughterboard. 2. Replace trackball. 3. Replace keyboard. 4. Replace interconnect board. 5. Return computer to Apple.
Cursor does not move when using mouse	1. Check mouse connection to ADB port. 2. Press reset switch. 3. Clean mouse ball and inside of mouse. 4. Replace mouse.

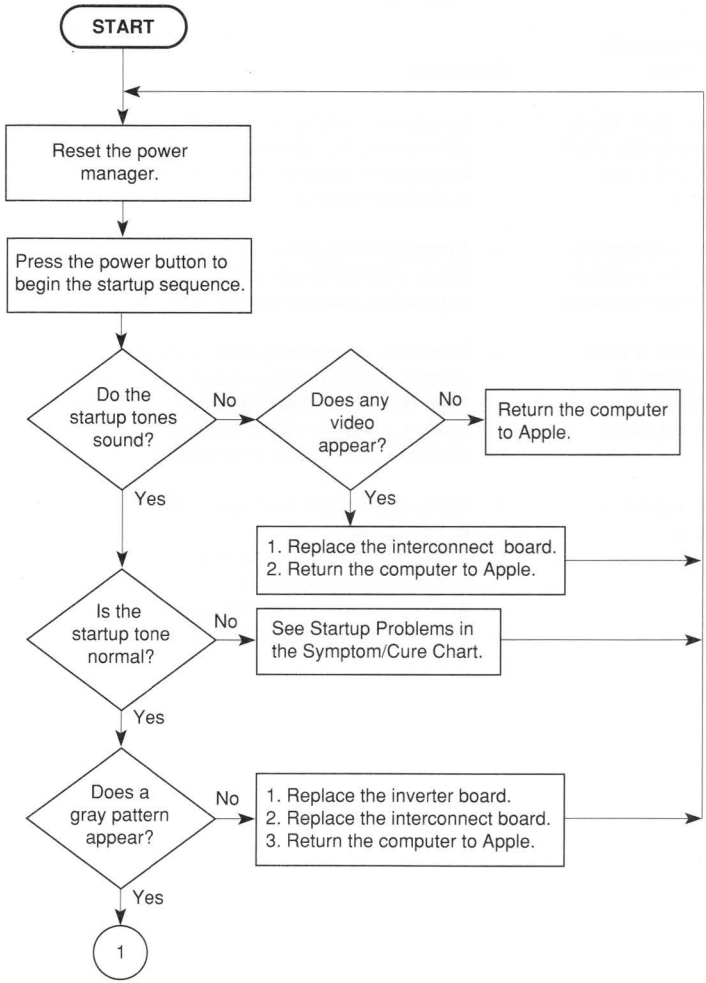
PowerBook 140/170
Troubleshooting—Symptom/Cure Chart

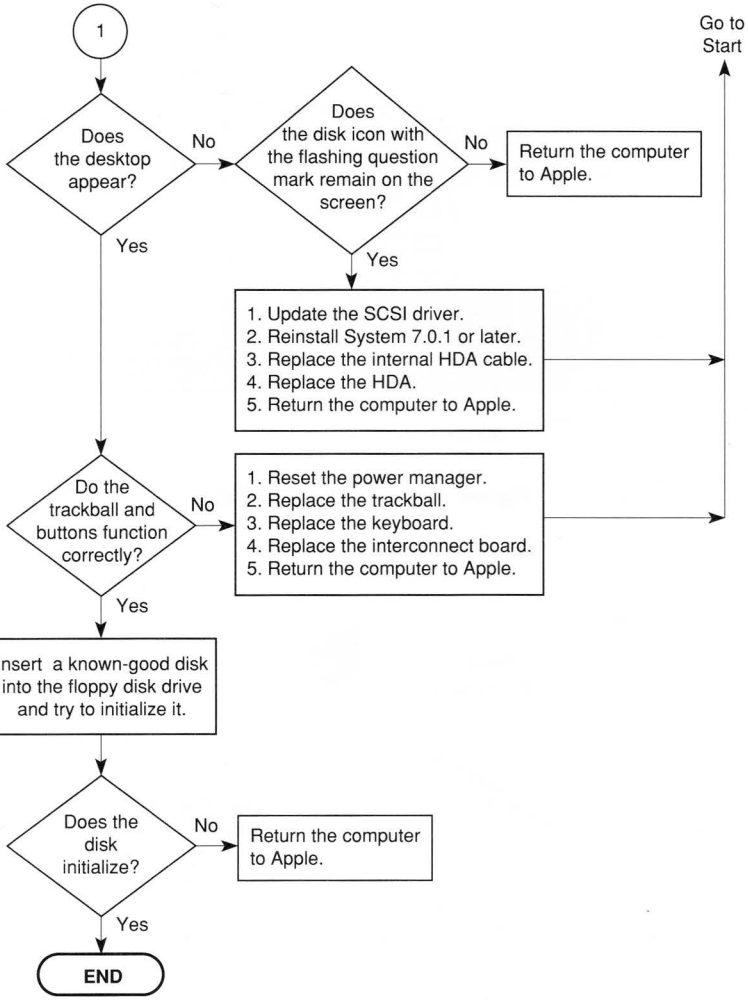
No response to any key on the keyboard	1. Verify that computer is on. 2. If screen is blank and you are trying to bring computer out of system sleep, try resetting power manager. 3. Check keyboard connections to interconnect board and interconnect board connection to daughterboard. 4. Replace keyboard. 5. Replace interconnect board. 6. Return computer to Apple.
Known-good ImageWriter, ImageWriter II, or LQ does not print	1. Make sure system software is 7.0.1 or later. 2. Make sure that Chooser is set correctly. 3. Verify printer cable is securely attached. 4. Replace printer cable. 5. Return computer to Apple.
Known-good LaserWriter does not print	1. Make sure system software is 7.0.1 or later. 2. Make sure Chooser is set correctly. 3. Verify that all printer cabling is securely attached. 4. Replace printer cable. 5. Try another printer. If printer works, computer is OK. Refer to network information on *Service Source* for further assistance. 6. Return computer to Apple.
Device connected to external modem port doesn't work	1. Verify that **External Modem** is selected in CDEV. 2. Make sure system software is 7.0.1 or later. 3. Check that all cabling is correctly and securely attached. 4. Attach device to known-good computer. 5. Return computer to Apple.
I/O devices are unrecognized or garbage is transmitted and/or received	1. Make sure system software is 7.0.1 or later. 2. Verify that all cabling is correctly and securely attached. 3. If device is SCSI type, verify that it is properly terminated. 4. Verify that no two SCSI devices have same device address. 5. Attach device(s) to known-good computer. 6. Return computer to Apple.

Internal Fax/Data Modem Problems	Solutions
Internal modem options do not appear in CDEV when modem is installed	1. Reseat modem board. 2. Make sure system software is 7.0.1 or later. 3. Replace modem board. 4. Return computer to Apple.
Modem does not respond properly to AT command set instructions	1. Verify that baud rate and data format settings of communications application are compatible with internal modem and remote modem. 2. Verify that modem cord is securely attached and working properly. 3. Reseat modem board. 4. Make sure system software is 7.0.1 or later. 5. Replace modem board. 6. Return computer to Apple.
Strange mix of characters appears on screen	1. Verify that baud rate and data format settings of communications application are compatible with internal modem and remote modem. 2. Verify that modem cord is securely attached and working properly. 3. Reseat modem board. 4. Make sure system software is 7.0.1 or later. 5. Replace modem board. 6. Return computer to Apple.
Modem connects but does not communicate with remote modem	– Verify that remote modem needs error correction (this is internal modem's default). If remote modem does not need error correction, disable error correction by typing **&Q0** (see *Macintosh PowerBook Fax/Data Modem User's Guide*).
Modem does not respond to incoming call	1. If system doesn't respond to an incoming call during sleep mode, verify that **Wake on Ring** option in CDEV is selected. 2. Verify that modem cord is working properly. 3. Replace modem board. 4. Return computer to Apple.
Modem interferes with system sound	1. Reseat modem board. 2. Replace modem board. 3. Replace interconnect board. 4. Return computer to Apple.

Modem has no sound output	1. Verify that Control Panel volume indicator is set above 0. 2. Replace modem board. 3. Replace interconnect board. 4. Return computer to Apple.

Miscellaneous Problems	**Solutions**
Screen goes blank and computer shuts down every few minutes	– Computer is going into system sleep to conserve battery power. If computer is going into system sleep too often, adjust sleep delays in Control Panel or connect power adapter.
Some applications seem to run slower after a few seconds	– Computer is switching to system rest. If system rest is interfering with the operation of an application, connect power adapter.
Hard disk is slow to respond, or screen goes blank too often	– Computer is powering down hard drive or going into system sleep to conserve battery power. If hard drive is shutting down or system is going into system sleep too often, adjust sleep delays in Control Panel or connect power adapter.
No sound from speaker	1. Verify that volume setting in Control Panel is 1 or above. 2. Check speaker connection to interconnect board, interconnect board connection to daughterboard, and daughterboard connection to motherboard. 3. Return computer to Apple.


START
Reset the power manager.
Press the power button to begin the startup sequence.
Do the startup tones sound?
No
Does any video appear?
No
Return the computer to Apple.
Yes
Yes
1. Replace the interconnect board.
2. Return the computer to Apple.
Is the startup tone normal?
No
See Startup Problems in the Symptom/Cure Chart.
Yes
Does a gray pattern appear?
No
1. Replace the inverter board.
2. Replace the interconnect board.
3. Return the computer to Apple.
Yes
1


1
Does the desktop appear?
No
Does the disk icon with the flashing question mark remain on the screen?
No
Return the computer to Apple.
Go to Start
Yes
Yes
1. Update the SCSI driver.
2. Reinstall System 7.0.1 or later.
3. Replace the internal HDA cable.
4. Replace the HDA.
5. Return the computer to Apple.
Do the trackball and buttons function correctly?
No
1. Reset the power manager.
2. Replace the trackball.
3. Replace the keyboard.
4. Replace the interconnect board.
5. Return the computer to Apple.
Yes
Insert a known-good disk into the floppy disk drive and try to initialize it.
Does the disk initialize?
No
Return the computer to Apple.
Yes
END

BACK VIEW

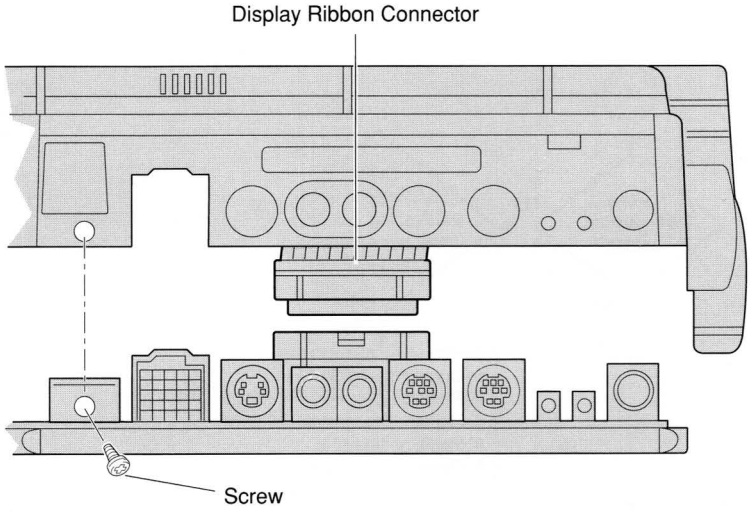


Figure: Removing the Top Case

SIDE VIEW

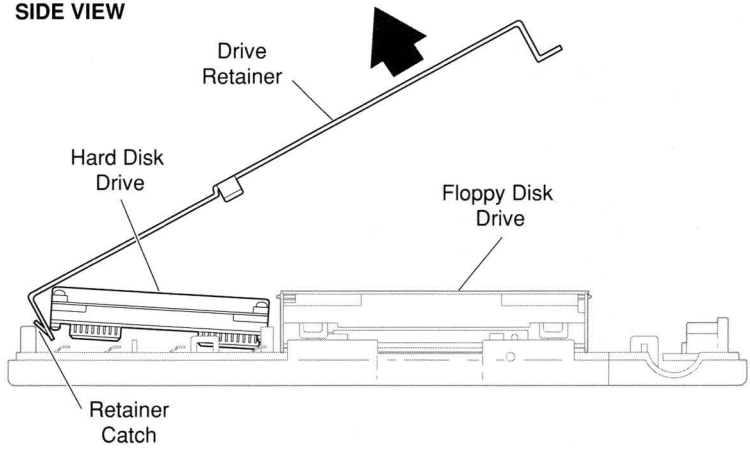


Figure: Removing the SCSI Hard Drive

Things to Remember

- Prior to removing or replacing PowerBook 140/170 modules, you must unplug the power adapter and remove the main battery.

Note: *Save RAM contents before removing the main battery. Otherwise, RAM contents will be lost.*

- Avoid excessive handling of the inside of the case and, if possible, wash your hands prior to working with the case.

CAUTION: When you unwrap, install, or replace modules, follow the appropriate electrostatic discharge (ESD) precautions. The PowerBooks are very susceptible to damage from electrostatic discharge. For more ESD information, see ESD Prevention under Safety in this guide.

Top Case

1. Remove the main battery and the I/O door.
2. Remove the four bottom screws and the screw on the back panel (**see Figure on previous page**).
3. Lift the top of the case, and disconnect the display ribbon connector.
4. To unhook the front fasteners, lift the top of the case away from you. Remove the top case.

SCSI Hard Drive

1. Remove the main battery, I/O door, and top case.
2. Disconnect the hard drive SCSI cable from the motherboard. **Handle this cable carefully; it is fragile.**
3. Remove the five screws holding the drive retainer in place.
4. Lift the drive retainer, on the side near the display, until the hard drive lifts. Lift out the hard drive (**see Figure on previous page**).

Note: *When replacing the drive retainer, position the hard drive SCSI cable so that it is above the drive retainer.*

Note: *The 17-mm-high drive retainer and the 19-mm-high drive retainers are not interchangeable. To tell which retainer you have, look at the center of the retainer. A 17-mm-high retainer will have a stair-step bend in the middle (**see Figure on previous page**). The 19-mm-high retainers have no bends in the middle.*

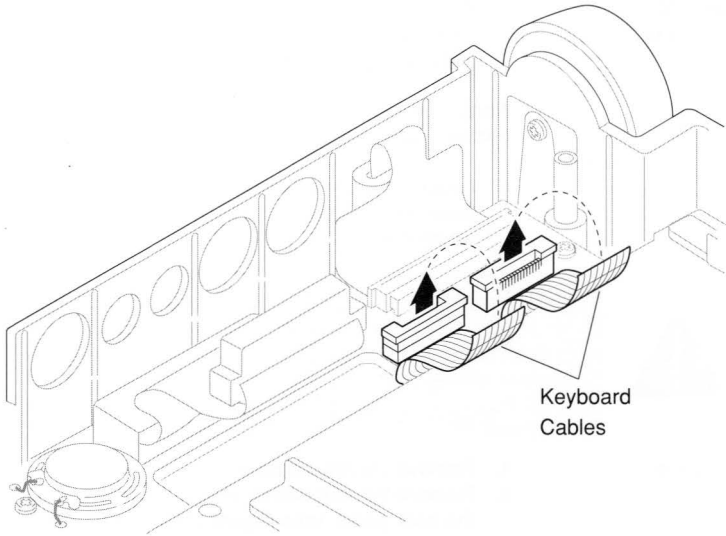


Figure: Removing the Keyboard

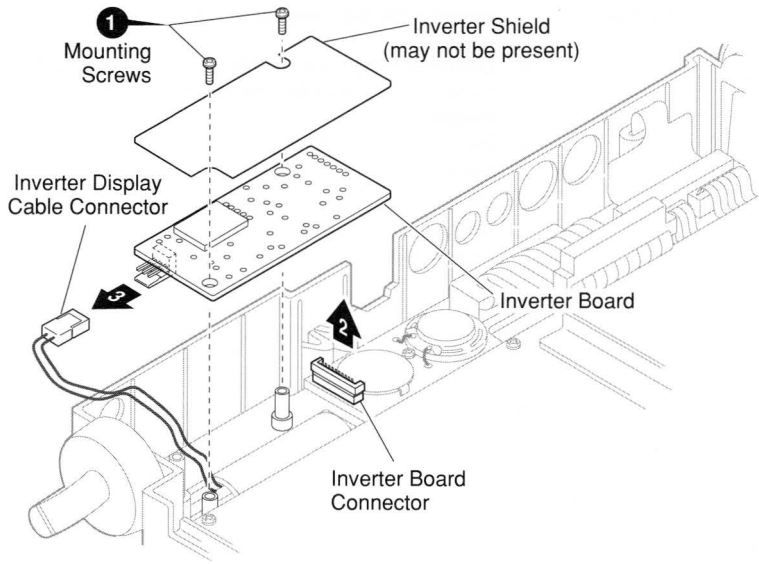


Figure: Removing the Inverter Board

Trackball Assembly

1. Remove the main battery, I/O door, and top case.
2. Disconnect the trackball cable from its connector. **Handle the cable carefully; it is fragile.**
3. Remove the two mounting screws.
4. Lift out the trackball assembly.

Keyboard Assembly

1. Remove the main battery, I/O door, top case, and trackball assembly.
2. Disconnect the keyboard cables from their connectors on the interconnect board (**see Figure on previous page**). **Handle these cables carefully; they are fragile.**
3. Remove the seven screws from the keyboard.
4. Lift the keyboard out of the top case.

Inverter Board

The PowerBook 140/170 computers have three discrete displays—one is active matrix and two are FSTN. Each display requires a matching inverter. When replacing a display or inverter board, make certain that the colored dot on the display cable matches the colored dot on the inverter. All of the inverter boards connect in the same manner.

1. Remove the main battery, I/O door, and top case.
2. Remove the two mounting screws from the inverter board (**see Figure on previous page**).

Note: *Some systems have a silver-colored inverter shield attached to the inverter (**see Figure on previous page**). This inverter shield enhances the computer's operation; do not remove or modify the shield.*

3. Remove the inverter shield (if present).
4. Disconnect the inverter board from the interconnect board by pulling the inverter board straight up.
5. Disconnect the three-pronged display inverter cable from the inverter board (**see Figure on previous page**).

Note: *The brightness and contrast actuators are the most frequently forgotten parts when reassembling the computer. Make certain that you align the actuators correctly on the inverter pots when you replace the inverter board. It is easiest to align the actuator on the pot if both are set at the extreme outer positions. You may need to use cellophane tape to hold the actuators in place while you connect the inverter board.*

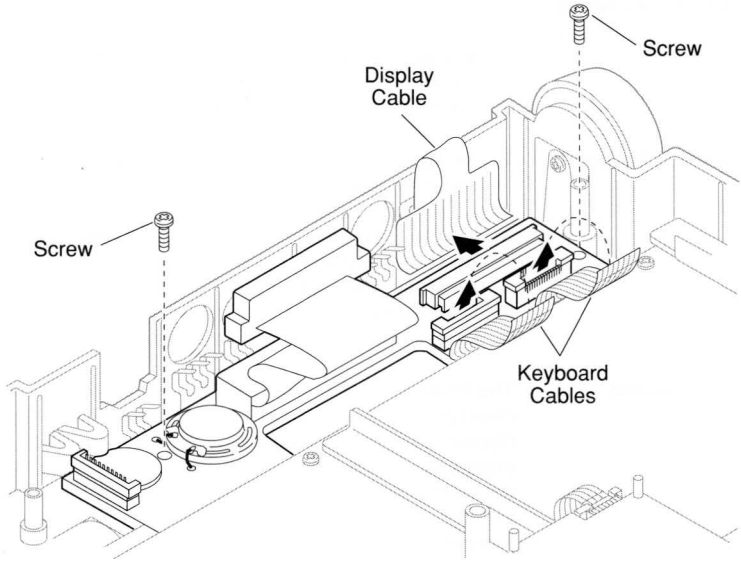


Figure: Removing the Interconnect Board

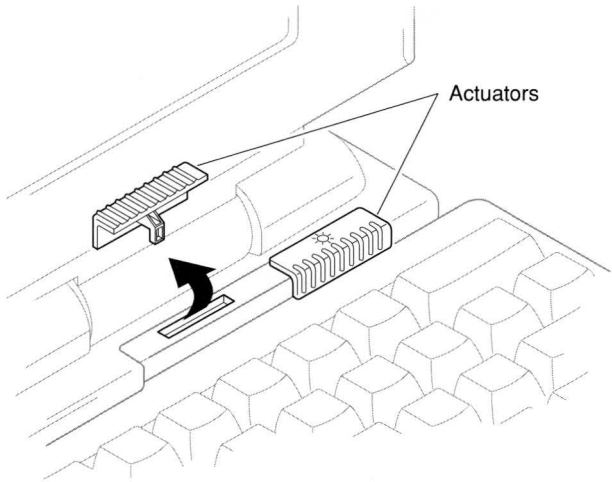


Figure: Removing the Brightness and Contrast Actuators

Interconnect Board

1. Remove the main battery, I/O door, top case, and inverter board.
2. Disconnect the keyboard and display cables from the interconnect card (**see Figure on previous page**). **Handle these cables carefully; they are fragile.**
3. Remove the two screws that hold the interconnect board in place.
4. Lift the interconnect board up and out of the top case.

Note: *Connect the display cable before you replace the interconnect board. It is very difficult to connect this cable after the interconnect board is in place.*

WARNING: The interconnect board contains hazardous materials. Return nonfunctional interconnect boards to Apple for proper disposal.

Brightness and Contrast Actuators

On the PowerBook 170, the contrast is preset, so **only a brightness actuator is on the front of the computer.** The PowerBook 140 (shown here) has both a contrast and a brightness actuator. The removal procedure for all actuators is the same.

1. Remove the main battery, I/O door, top case, and inverter board.
2. Pull up while rotating the actuator toward the display (**see Figure on previous page**).

Note: *The brightness and contrast actuators are the most frequently forgotten parts when reassembling the computer. Make certain that you align the actuators correctly on the inverter pots when you replace the inverter board. It is easiest to align the actuator on the pot if both are set at the extreme outer positions. You may need to use cellophane tape to hold the actuators in place while you connect the inverter board.*

Elevation Feet

1. Remove the main battery, I/O door, and top case.
2. Remove the screw that holds the elevation foot.
3. Lift the spring clip up, and the elevation foot will fall off.

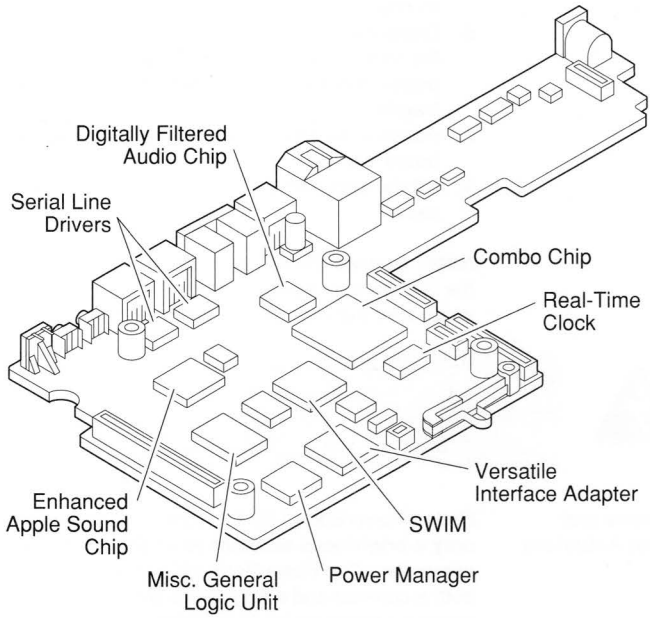


Figure: Motherboard Components

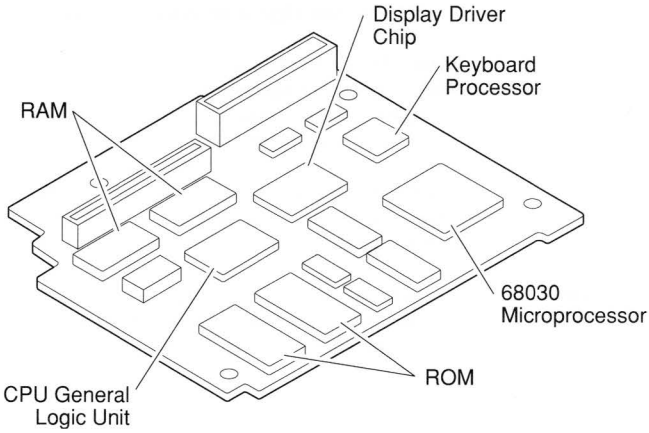


Figure: Daughterboard Components

Installation

RAM	PowerBook	Upgrade Procedure (see Figure below)
2 MB	140	Standard configuration for computer
4 MB	140	Insert 2 MB RAM expansion card
6 MB	140	Replace 2 MB RAM expansion card with 4 MB RAM expansion card
8 MB	140	Replace 4 MB RAM expansion card with 6 MB RAM expansion card (3rd party only)
4 MB	170	Standard configuration for computer
6 MB	170	Replace 2 MB RAM expansion card with 4 MB RAM expansion card
8 MB	170	Replace 4 MB RAM expansion card with 6 MB RAM expansion card (3rd party only)

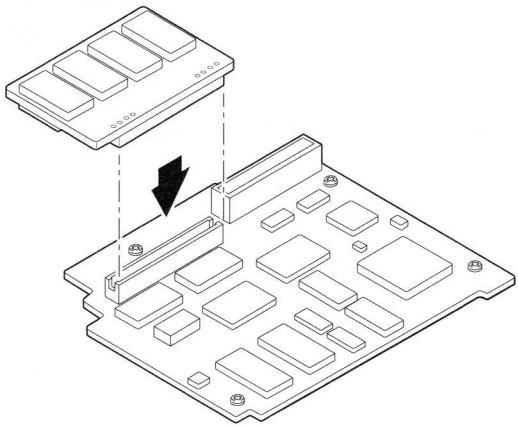


Figure: Inserting the RAM Expansion Card

Verification

Inserted RAM Expansion Card	Total Memory (inside Get Info–virtual memory off) Built-in Memory (inside Get Info–virtual memory on)
2 MB	4096 K
4 MB	6144 K
6 MB	8192 K

If the amount of RAM is not correct:

1. Replace the RAM expansion card.
2. If the amount of RAM indicated is still not correct, return the computer to Apple.

Fax/Data Modem Removal

The modem is a standard feature on the PowerBook 170; it is an option on the PowerBook 140.

1. Remove the main battery, I/O door, and top case.

CAUTION: The components on the modem are very sensitive to ESD. Follow ESD precautions with extra care when touching this board.

2. Remove the two screws holding the modem on the top of the motherboard hex nuts (**see Figure below**).

3. Disconnect the modem from the motherboard.

Note: *For installation, the modem port cover must be removed to uncover the modem port. To remove the modem port cover, pinch the tabs together at their base and push the cover through the computer's back panel from inside to outside.*

Note: *When installing the modem, affix the FCC modem label and the DOC label to the inside of the I/O door. Position the FCC modem label so that it aligns with the modem port, and the DOC label so that it aligns with the HD-30 SCSI port.*

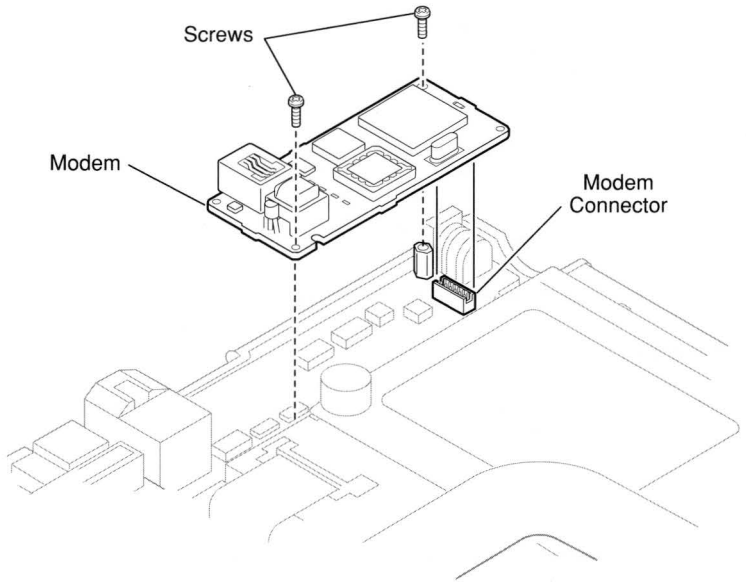
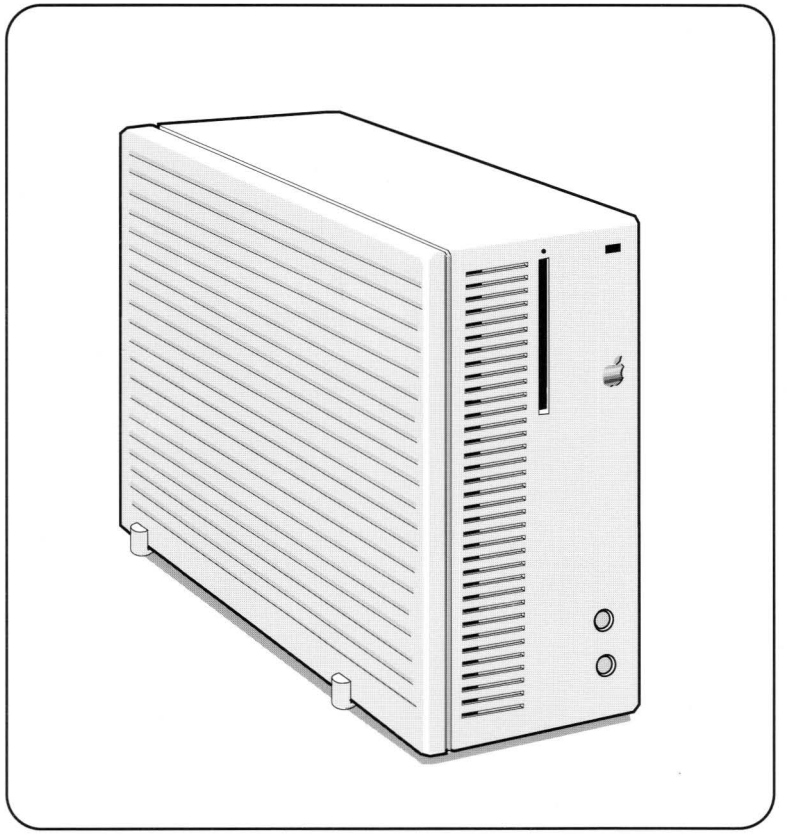


Figure: Removing the Fax/Data Modem

Macintosh Quadra 700

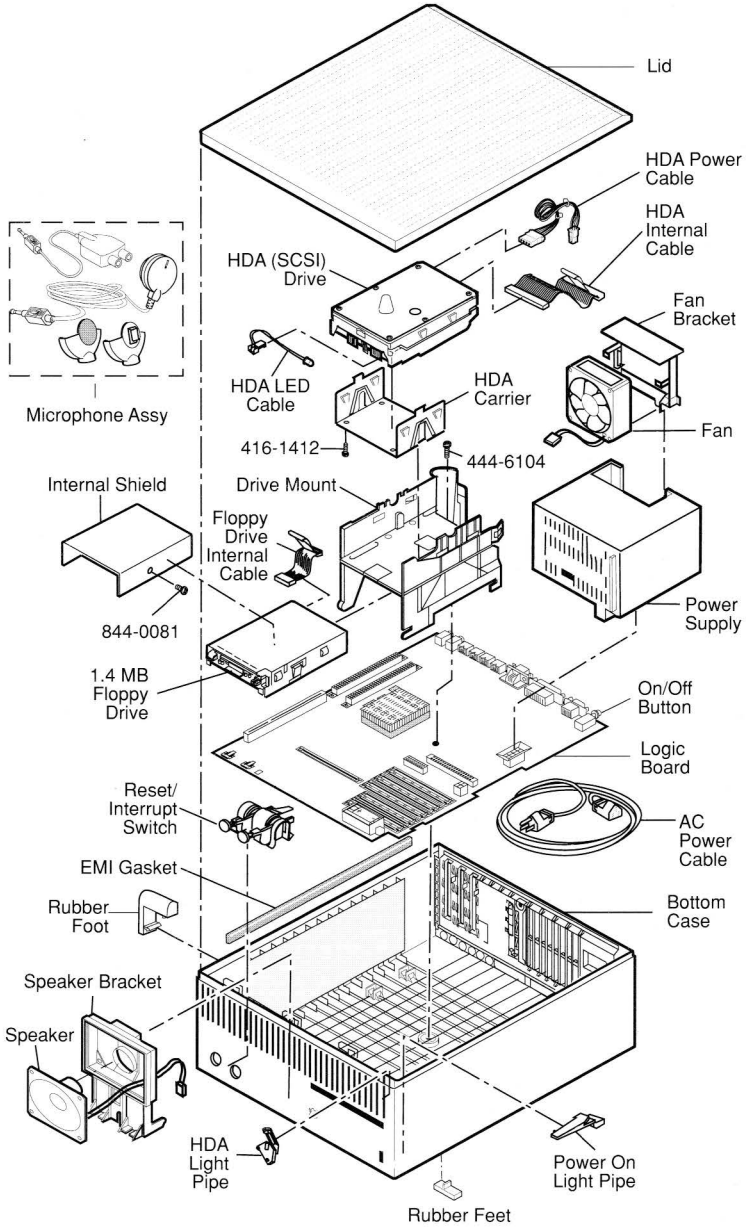
Table of Contents

Contents **Page**



Macintosh Quadra 700

Exploded View



Macintosh Quadra 700

Parts List

Bottom Case 630-5992
- EMI Gasket 875-0110
- HDA Light Pipe 815-6271
- Light Pipe, Power-On 815-6272
- On/Off Button 815-6033
- Rubber Feet 865-0026
- Rubber Foot 865-0800

Cable, AC Power (smoke) 590-0380
Carrier, HDA, Internal 3.5-Inch, SCSI 805-5078
Drive Mount 810-6040
Dust Shield, Package of 5 076-0439
Floppy Drive, 1.4 MB, Apple SuperDrive (internal) 661-0474
- Cable, Internal Floppy Drive (yellow stripe) 590-0607
- Screw, Socket, Phillips (1.4 MB mechanism) 844-0018
- Shield, Internal (1.4 MB Mechanism) 805-0961

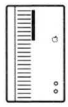
HDA, Internal 3.5-Inch SCSI, 80 MB 661-0600
HDA, Internal 3.5-Inch SCSI, 160 MB 661-1641
HDA, Internal 3.5-Inch SCSI, 400 MB 661-1636
- Cable, HDA LED (amber) 590-0506
- Cable, HDA LED (fits 1-inch-height drives) 590-0527
- Cable, HDA LED (40 MB HDA) 590-0248
- Cable, Internal HDA Power (2 x 2 pin) 590-0512
- Cable, Internal HDA 590-0609
- Screw, 6-32 x .250 (HDA to HDA bracket) 444-6104
- Service Packaging, HDA, 3.5-Inch, Half-Height; and 3.5-Inch, 1-Inch-Height, with Carrier. 602-0282

Lid 810-6038
Lithium Battery. 742-0111
- Battery Holder Cover. 520-0344

Logic Board 661-0666
- DRAM SIMM, 1 MB, SOJ, 80 ns. 661-0520
- DRAM SIMM, 1 MB, SOJ, 80 ns. 661-0719
- VRAM SIMM, 256K, 100 ns. 661-0666
- VRAM SIMM, 256K, 80 ns. 661-0722

Microphone Assembly 699-5071
Power Supply with Fan 661-0467
- Bracket, Power Supply Fan 815-5071
- Power Supply Fan 982-0023

Reset/Interrupt Switch 815-6270
Speaker 630-5999
- Speaker Bracket 815-6031



Macintosh Quadra 700

Symptom/Cure Chart

System Problems	Solutions
Startup error chords—4 tones (hardware failure)	1. Disconnect SCSI hard disk power and cable connectors; restart. 2. Disconnect floppy drive cable connector; restart. 3. Exchange logic board.
Startup error chords—8 tones (DRAM SIMM failure)	1. Exchange DRAM SIMMs. 2. Exchange logic board. 3. Perform DRAM SMM verfication with exchange logic board.
Does not power on—screen is black, fan is not running, and LED is not lit	1. Check cables. 2. Plug monitor directly into wall socket and verify that monitor has power. 3. Replace power cord. 4. Replace power supply. 5. Replace logic board. Retain customer's SIMMs.
Clicking, chirping, or thumping sound	1. Replace power supply. 2. Replace logic board. Retain customer's SIMMs.
System shuts down intermittently	1. Be sure to keep case air vents on **sides and top**. Thermal protection circuitry may shut system down. After 30-40 minutes, system should be OK. 2. Replace power cord. 3. Check battery. Replace if below 3.2 volts. 4. Replace power supply. 5. Replace logic board. Retain customer's SIMMs.
System intermittently crashes or locks up	1. Make sure you are using correct version of system software. 2. Make sure you are using known-good software. 3. Identify and replace defective DRAM SIMMs. 4. Replace logic board. Retain customer's SIMMs. 5. Replace power supply.

Video Problems	Solutions

Note: If replacing the monitor corrects the problem, refer to *Apple Service Technical Procedures* or *Service Source* for troubleshooting information.

Screen is completely dark, fan is not running, and LED is not lit	1. Plug monitor directly into wall socket, and verify that monitor has power. 2. Check battery; replace if voltage is less than 3.2. 3. Replace power supply. 4. Replace logic board. Retain customer's SIMMs.

Screen is black, audio and drive operate, fan is running, and LED is lit	1. Adjust brightness on monitor. 2. Replace video cable. 3. If video interface card is installed, move card to different slot. 4. Replace video interface card, if installed. 5. Replace VRAM SIMMs. 6. Replace defective DRAM SIMMs. 7. Replace monitor. 8. Replace logic board. Retain customer's SIMMs. 9. Replace power supply.
Screen is black, audio and drive do not operate, but fan is running and LED is lit	1. Replace video cable. 2. If a video interface card is installed, move card to a different slot. 3. Replace video interface card, if installed. 4. Replace VRAM SIMMs. 5. Replace defective DRAM SIMMs. 6. Replace logic board. Retain customer's SIMMs. 7. Replace power supply. 8. Replace monitor.
Partial or whole screen is bright and audio is present, but no video information is visible	1. Replace video cable. 2. If a video card is installed, move card to a different slot. 3. Replace video interface card, if installed. 4. Replace VRAM SIMMs. 5. Replace monitor. 6. Replace logic board. Retain customer's SIMMs.

Foppy Drive Problems	**Solutions**
Internal floppy drive runs continuously	1. Replace bad disk with known-good system disk. 2. Replace internal floppy drive cable. 3. Replace internal floppy drive. 4. Replace logic board. Retain customer's SIMMs.
Audio and video are present, but internal floppy drive does not operate	1. Replace bad disk with known-good system disk. 2. Verify that all external SCSI devices are disconnected. 3. Replace internal floppy drive cable. 4. Replace internal floppy drive. 5. Replace logic board. Retain customer's SIMMs. 6. Replace power supply.
Disk ejects; display shows icon with blinking "X"	1. Replace bad disk with known-good system disk. 2. Replace internal floppy drive cable. 3. Replace internal floppy drive. 4. Replace logic board. Retain customer's SIMMs.

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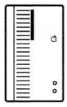
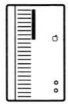


Macintosh Quadra 700
Symptom/Cure Chart

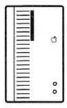
Floppy Drive Problems (continued)	Solutions
Will not eject disk	1. Switch power off and hold mouse button down while switching power back on. 2. Replace internal floppy drive.
Attempts to eject disk but can't	1. Reinsert disk and try to eject disk again. 2. Reseat floppy drive bezel and/or disk drive so the slot in the bezel aligns correctly with the disk drive.
MS-DOS drive does not recognize a disk formatted on a 1.4 MB SuperDrive	– To ensure read/write compatibility with the 1.4 MB SuperDrive, format all disks with the MS-DOS drive first.

SCSI Hard Drive Problems	Solutions
Internal SCSI drive does not operate; drive doesn't spin up	1. Replace internal SCSI drive cable. 2. Replace SCSI power cable. 3. Replace SCSI drive. 4. Replace logic board. Retain customer's SIMMS.
Drive does not appear on the desktop	1. Verify there are no duplicate SCSI device addresses. 2. Drive may not be initialized. If drive has just been installed, initialize the drive with HD SC Setup and install system software.
Works with internal or external SCSI devices, but not with both	1. Make sure SCSI device switch setting on external device(s) is not set to **7** (the computer's address) or the same number as an internal SCSI device. 2. Replace external SCSI terminator. 3. Verify that SCSI termination is installed on internal SCSI drive. 4. Refer to *Apple Service Technical Procedures* or *Service Source* to troubleshoot the external device.

Peripheral Problems	Solutions
Cursor does not move	1. Check mouse connection. 2. Inspect inside of mouse for buildup of dirt or other contaminants. Clean mouse if necessary. 3. If mouse was connected to keyboard, connect it to a rear ADB port instead. If mouse works, replace keyboard. If mouse does not work in any ADB port, replace mouse. 4. Replace logic board. Retain customer's SIMMs.



Cursor moves, but clicking mouse button has no effect	1. Replace mouse. 2. Replace logic board. Retain customer's SIMMs.
No response to any key on keyboard	1. Check keyboard connection to ADB port. 2. Replace keyboard cable. 3. Replace keyboard. 4. Replace logic board. Retain customer's SIMMs.
Cannot double-click to open application, disk, or server	1. Remove duplicate system files on the hard disk. 2. Clear parameter RAM. Hold down <Command><Option><R><P> keys while booting system. Release the keys when the computer generates a startup chord a second time. Reset mouse controls. 3. If mouse was connected to keyboard, connect it to a rear ADB port instead. If mouse works, replace keyboard. If mouse does not work in any ADB port, replace mouse. 4. Replace logic board. Retain customer's SIMMs.
Known-good serial printer does not print	1. Make sure you are using correct version of system software. 2. Make sure Chooser and Control Panel are set correctly. 3. Replace printer interface cable. 4. Replace logic board. Retain customer's SIMMs.
Known-good LaserWriter on an AppleTalk network does not print	1. Make sure you are using correct version of system software. 2. Make sure Chooser and Control Panel are set correctly. 3. Refer to Networks manual in *Service Source.*
Miscellaneous Problems	**Solutions**
No sound from speaker	1. Verify that volume setting in Control Panel is one or above. 2. Replace speaker. 3. Replace logic board. Retain customer's SIMMs.



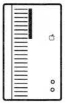
Macintosh Quadra 700

Specifications

Microprocessor	MC68040, 25.0 MHz Built-in PMMU, math coprocessor, and 8K cache 32-bit address bus; 32-bit registers
ROM	1 MB soldered on the logic board ROM SIMM socket
DRAM	4 MB standard—expandable to 8 MB using 1 MB DRAM SIMMs (80 ns) or 20 MB using 4 MB DRAM SIMMs (from a third party manufacturer) Additional memory expansion through NuBus slots
Video RAM	512K standard—expandable to 1 or 2 MB using 256K VRAM SIMMs (100 ns)
Interfaces	Two ADB connectors (mini DIN-4) for keyboard, mouse, and low-speed input devices Two NuBus slots (96-pin Euro-DIN connector) One 68040 processor-direct slot (PDS) Two RS-422 (RS-232-compatible) serial ports (mini-8), 230.4 Kbaud maximum
Disk Drives	Internal Apple SuperDrive Internal 3.5-inch SCSI hard disk (80, 160, or 400 MB)
Video Display	Built-in VRAM video support for all Apple monitors; six VRAM expansion slots (three banks) Multiple external color and monochrome monitors through NuBus expansion slots
Sound	Enhanced Apple sound chip (EASC), including four-voice wave-table synthesis and stereo sampling generator capable of driving stereo mini phone jack headphones or stereo equipment Mixed stereo monophonic output—internal speaker Sound input—omnidirectional microphone (output voltage is 4 milivolts, peak-to-peak, at normal speaking volume)
Keyboard	Apple Keyboard, Apple Extended Keyboard, Apple Keyboard II, or Apple Extended Keyboard II

Macintosh Quadra 700

Specifications



Mouse	ADB mouse (mini DIN-4)
Input Power	100 to 240 volts AC (rms), automatically configured 50-60 Hz single phase 130 watts maximum (not including monitor power connector load), 90 watts maximum continuous
Output Power	Output receptacle: 100-240 volts (rms) (determined by actual input voltage) DC output: 90 watts maximum +5 volts 12.0 amps (60 watts) +12 volts 1.5 amps (18 watts) –12 volts 1.0 amps (12 watts)
Power Supply Ratings	Input voltage range: 85-135 volts (rms); 170-270 volts (rms) Input surge range: 300 volts (rms) for 100 ms Input line transient immunity: 0-6 kilovolts with no component failures Peak inrush current: 40 amps for all load and line conditions Input line frequency: 47-63 Hz, single phase Line dropout immunity: 20 ms minimum, for 85 volts (rms); 50 Hz input and maximum load Input/Output power efficiency: 70% minimum for all conditions and maximum load
Clock/Calendar	CMOS custom chip with long-life lithium battery 256 bytes of parameter memory
Operating Temp	50° F to 104° F (10° C to 40° C)
Storage Temp	-40° F to 116.6° F (-40° C to 47° C)
Rel. Humidity	20% to 80% (noncondensing)
Altitude	0 to 10,000 feet (0 to 3048 meters)
Physical Specifications	Height: 5.5 inches (140 millimeters) Width: 11.9 inches (312 millimeters) Depth: 14.4 inches (365 millimeters) Weight: 13 pounds, 10 ounces (6.2 kilograms)

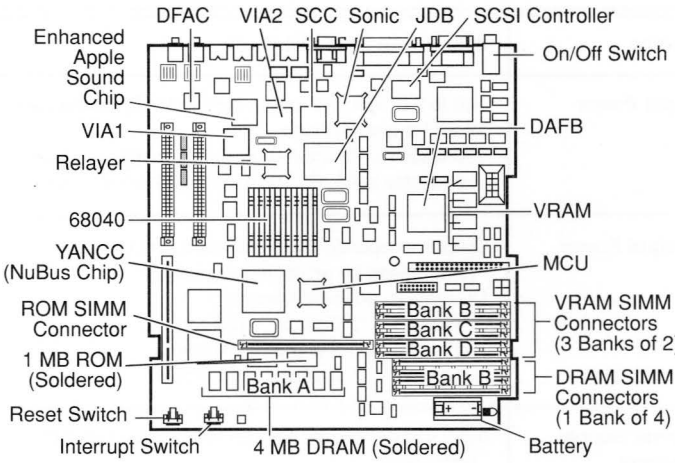


Figure: Macintosh Quadra 700 Logic Board

DRAM

The Macintosh Quadra 700 has 4 MB of DRAM soldered on the logic board (bank A) and accepts four same-size DRAM SIMMs (80 ns or faster) in bank B. Configurations greater than 8 MB require third-party DRAM SIMMs.

Total DRAM	Bank A (soldered)	Bank B
4 MB	4 MB	Empty
8 MB	4 MB	Four 1 MB SIMMs
20 MB	4 MB	Four 4 MB SIMMs

VRAM

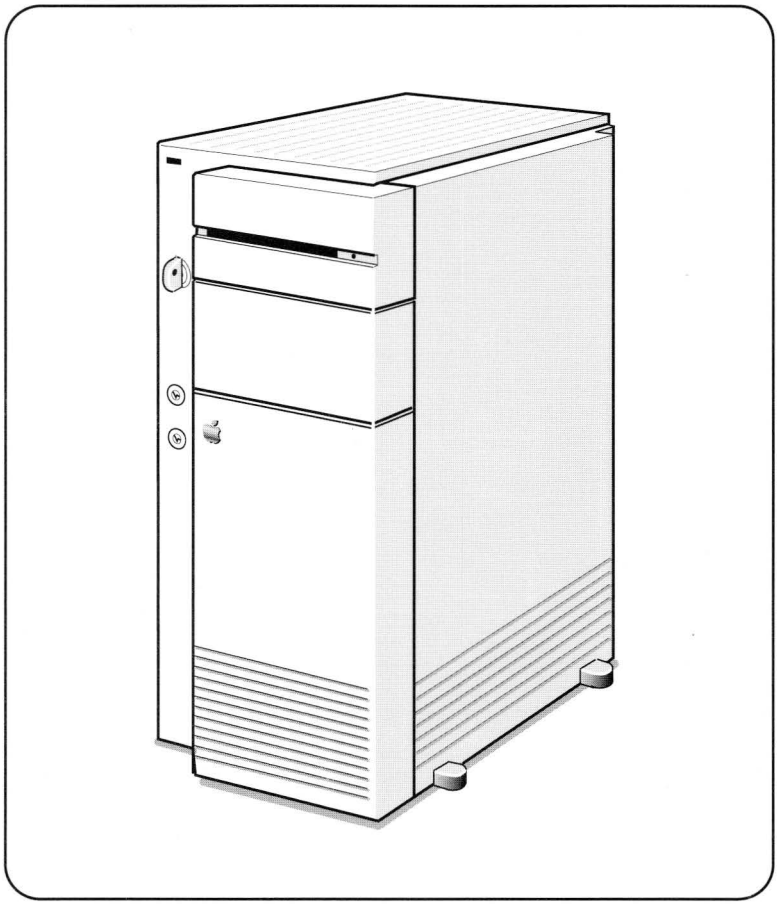
The Macintosh Quadra 700 has 512K of VRAM soldered on the logic board (bank A). VRAM is expandable to 1 MB or 2 MB by way of VRAM SIMM sockets (banks B, C, and D), each of which holds two 256K VRAM SIMMs.

Total VRAM	Bank A (soldered)	Bank B	Bank C	Bank D
512K	512K	Empty	Empty	Empty
1 MB	512K	Two 256K SIMMS	Empty	Empty
2 MB	512K	Two 256K SIMMS	Two 256K SIMMs	Two 256K SIMMs

Macintosh Quadra 900

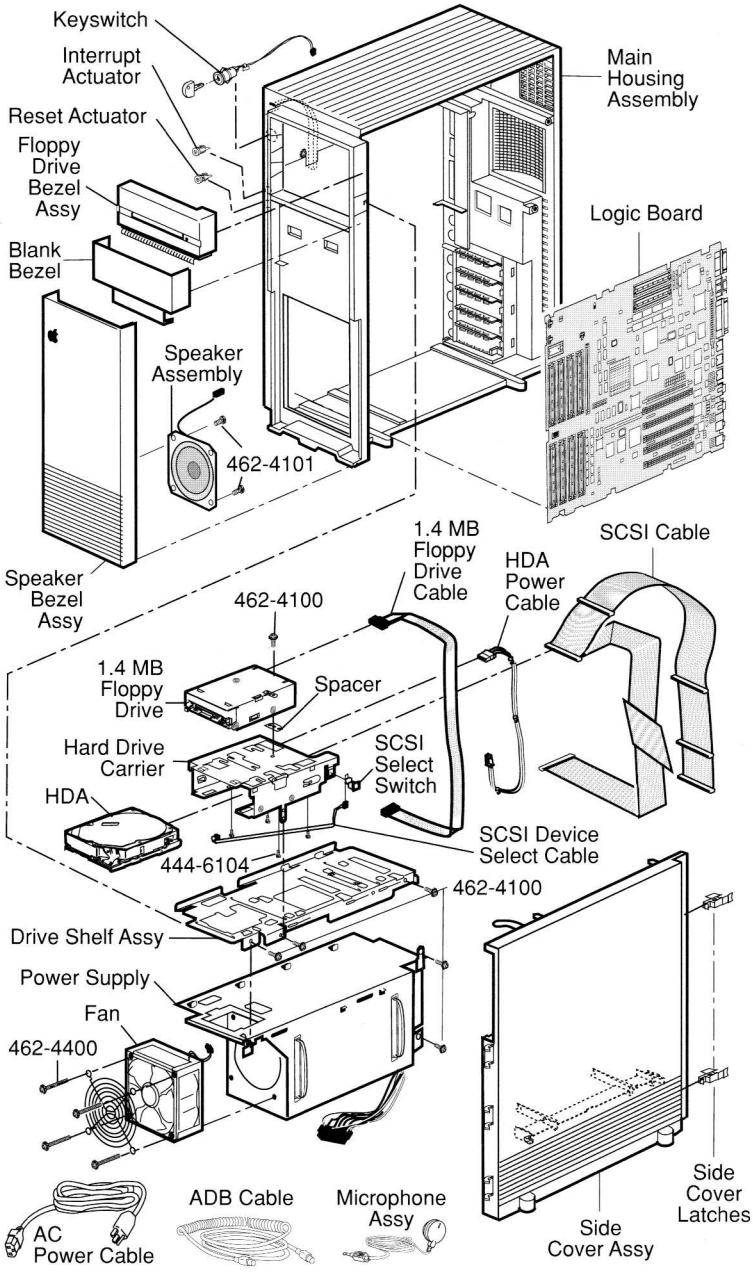
Table of Contents

Contents **Page**



Macintosh Quadra 900

Exploded View



Macintosh Quadra 900

Parts List

Actuators—
- Interrupt Actuator 815-6250
- Reset Actuator 815-6249

Apple Logo 825-1256
Blank Bezel Assembly 076-0431
Cable, ADB, 2 Meter 590-0152
Cable, Power AC, 110 V 590-0760
Fan, Power Supply 720-0518
- Exhaust Vent Cover (included with main housing) 076-0432
- Screw, 3.5 x 45 mm, SEM Machine (fan to power supply)) 462-4400

Floppy Disk Drive, 1.4 MB Apple SuperDrive 661-0474
Floppy Disk Drive—Accessories
- Spacer, Apple SuperDrive (included in screw kit) 805-5113
- Bezel Assembly, Floppy Drive 076-0437
- Cable, 1.4 MB Apple SuperDrive, Internal 590-0515
- Drive Carrier, Apple SuperDrive (also used as shipping fixture) 805-5050
- Dust Shield, 1.4 MB Apple SuperDrive (package of 5) 076-0439
- Packing Disk 003-0003
- Service Packaging, SuperDrive 602-0210

HDA, 160 MB, 3.5" SCSI (without carrier) 661-1641
HDA, 400 MB, 3.5" SCSI (without carrier) 661-1636
- Cable, SCSI (with terminator) 590-0528
- Cable, HDA Power 590-0517
- Cable, SCSI Device Select (for use with 661-1641) 590-0518
- Cable, SCSI Device Select (for use with 661-1636) 590-0790
- Drive Shelf Assembly (includes Velcro cable straps) 630-6097
- Hard Drive Carrier, Internal 3.5" or 5.25" 805-5106
- Screw, 6 - 32 x .25 (hard drive carrier to hard drive) 444-6104
- Screw, 3.5 x .6 x .8 mm (drive shelf assembly to power supply) .. 462-4100
- Service Packaging, HDA, 3.5", Half-Height 602-0282
- Switch, SCSI Device Select 705-0045

Keyswitch (with two keys) 705-0175
Light Pipe, Power LED (included with main housing) 815-6251
Logic Board (without DRAM/VRAM SIMMs) 661-0665
Logic Board Components—
- Jumper Connector (package of 10) 517-0546
- Lithium Battery 742-0011
- Battery Holder Cover 520-0344

Main Housing Assembly (includes product label, NuBus slot covers, fan exhaust vent cover, and light pipe) 076-0434
Microphone Assembly 699-5073
Miscellaneous Screw Kit 076-0435
- Screw Kit Includes:
  - Screw, 3.5 x .610 mm, Self-Tapping 420-1001
  - Screw, 3.5 x 6 mm, Pan-Head Machine 462-4101
  - Screw, 3.5 x 45 mm, SEM Machine 462-4400
  - Apple SuperDrive Spacer 805-5113

continued...

Power Supply (includes fan) 661-0664
Screw, 3.5 x .6 x .8 mm (power supply to case) 462-4100
Side Cover Latch 815-6262
Side Cover Assembly (includes NuBus card guides) 076-0436
SIMMs—
DRAM SIMM, 1 MB 80 ns 661-0520
DRAM SIMM, 1 MB 80 ns 661-0719
DRAM SIMM, 1 MB 80 ns, Parity 661-0546
Speaker Assembly 630-6011
Screw, 3.5 x 6 mm (speaker to bezel assembly). 462-4101
Speaker Bezel Assembly 076-0433

Board Diagram

The figure below illustrates the internal connectors on the Macintosh Quadra 900.

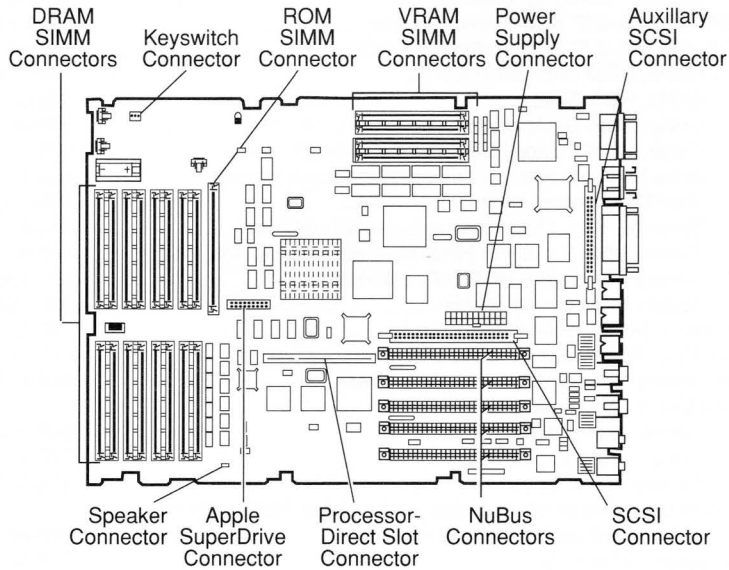
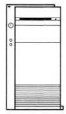


Figure: Board Diagram

Macintosh Quadra 900
Symptom/Cure Chart



System Problems	Solutions
Four-tone error chord plays at startup	1. If system boots from internal hard drive, disconnect SCSI cable from logic board and restart system. If startup sequence is normal, reinitialize hard drive. If error chord still sounds, replace hard drive. 2. If system boots from internal floppy drive, disconnect floppy drive cable and restart system. If startup sequence is normal, replace floppy drive. 3. If error chord still sounds at startup, replace logic board. Retain customer's SIMMs.
Eight-tone error chord plays at startup	1. Install four known-good DRAM SIMMs in bank A and switch on system. If no error chord sounds, proceed with testing of customer's DRAM SIMMs. 2. Switch system off, replace one known-good SIMM with customer SIMM. Switch system on. If no error chord sounds, customer SIMM is good. 3. Repeat step 2 to test each customer SIMM.
System does not power on—screen black, fan not running, and LED not lit	1. Check power cables. 2. Plug monitor directly into wall socket and verify that monitor has power. 3. Replace power cord. 4. Replace power supply. 5. Replace logic board. Retain customer's SIMMs.
Clicking, chirping, or thumping sound	1. Replace power supply. 2. Replace logic board. Retain customer's SIMMs. 3. Replace floppy drive cable. 4. Replace floppy drive.
System shuts down intermittently	1. Make sure air vents at rear of system and on side cover are clear. Thermal protection circuitry may shut system down. System should start after 30 to 40 minutes. 2. Replace power cord. 3. Check voltage of lithium battery on logic board. If battery voltage is below 3.2 volts, replace battery. 4. Replace power supply. 5. Replace logic board. Retain customer's SIMMs.
System crashes or hangs intermittently	1. Make sure system software is 7.0.1 or later. 2. Verify that software (applications, INITs, CDEVs, RDEVs, etc.) is compatible with System 7. 3. Identify and replace defective DRAM SIMMs. 4. Replace logic board. Retain customer's SIMMs. 5. Replace power supply.

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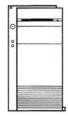


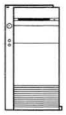
Macintosh Quadra 900
Symptom/Cure Chart

System Problems (continued)	Solutions
System does not power on when monitor not attached	1. Attach monitor to system. (Unless system is configured as a server, it will not power on without monitor attached.) 2. If system is a server, install Virtual Monitor Switch Control panel to power-on system.

Video Problems	Solutions
Partial or whole screen bright and audio present, but no video information visible	1. Replace monitor. 2. Replace video cable. 3. Move video interface card (if installed) to a different slot. 4. Replace video interface card (if installed). 5. Replace logic board. Retain customer's SIMMs.
Screen is black, audio and drive operate, fan runs, and LED is lit	1. Adjust brightness on monitor. 2. Replace monitor. 3. Replace video cable. 4. If video interface card is being used with monitor, move card to a different slot. 5. If video interface card is being used with monitor, replace card. 6. Identify and replace defective DRAM SIMMs. 7. Replace logic board. Retain customer's SIMMs. 8. Replace power supply.
Screen is black, audio and drive do not operate, fan runs, and LED is lit	1. Replace video cable. 2. Move video interface card (if installed) to a different slot. 3. Replace video interface card (if installed). 4. Identify and replace defective DRAM SIMMs. 5. Replace logic board. Retain customer's SIMMs. 6. Replace power supply.

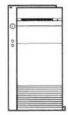
Note: If replacing monitor corrects video problem, refer to appropriate *Service Source* manual for monitor troubleshooting information.

Apple SuperDrive Problems	Solutions
Drive does not operate	1. Verify that keyswitch is not on *secure*. 2. Replace floppy disk. 3. Replace floppy drive cable. 4. Replace floppy drive. 5. Replace logic board. Retain customer's SIMMs. 6. Replace power supply.



Drive runs continuously	1. Replace floppy disk. 2. Replace floppy drive cable. 3. Replace floppy drive. 4. Replace logic board. Retain customer's SIMMs.
During system startup, disk ejects; display shows icon with blinking "x"	1. Replace disk with known-good system disk. 2. Replace floppy drive cable. 3. Replace floppy drive. 4. Replace logic board. Retain customer's SIMMs.
Drive will not eject disk	1. Verify that keyswitch is not on *secure.* 2. Switch power off and hold mouse button down while switching power back on. 3. Replace floppy drive. 4. Replace floppy drive cable. 5. Replace logic board. Retain customer's SIMMs.
Drive attempts to eject disk, but disk does not eject	1. Reseat floppy drive bezel and/or disk drive so that slot in bezel aligns correctly with disk drive. 2. Eject disk manually with paper clip. 3. Replace floppy drive.
MS-DOS drive does not recognize disk formatted on SuperDrive	– Format all disks with the MS-DOS drive first.

SCSI Hard Drive Problems	**Solutions**
Single internal SCSI drive does not operate; drive does not spin	1. Replace SCSI cable. 2. Replace SCSI power cable. 3. Replace SCSI drive.
Drive does not appear on desktop	1. Make sure each SCSI device has unique SCSI device address. 2. Use *HD SC Setup* to initialize drive.
No internal SCSI drives operate	1. Make sure each SCSI device has unique SCSI device address. 2. Verify SCSI device termination. 3. Replace SCSI cable. 4. Replace power supply. 5. Replace logic board. Retain customer's SIMMs.
System works with internal or external SCSI devices, but not with both	1. Make sure each SCSI device has unique SCSI device address. 2. Replace external SCSI terminator. 3. Make sure internal SCSI drives are not terminated. 4. Troubleshoot external device using appropriate *Apple Service Technical Procedures* manual.



Macintosh Quadra 900
Symptom/Cure Chart

Peripheral Problems	Solutions
Cursor does not move	1. Make sure keyswitch is not on *secure*. 2. Check mouse connection. 3. Inspect inside of mouse for buildup of dirt or other contaminants. Clean mouse. 4. If mouse was connected to keyboard, connect mouse to rear ADB port. If mouse now works, replace keyboard. 5. If mouse doesn't work in any ADB port, replace mouse. 6. Replace logic board. Retain customer's SIMMs.
Cursor moves, but clicking mouse button has no effect	1. Replace mouse. 2. Replace logic board. Retain customer's SIMMs.
No response to any key on keyboard	1. Make sure keyswitch is not on *secure*. 2. Verify keyboard connection to ADB port. 3. Replace keyboard cable. 4. Replace keyboard. 5. Replace logic board. Retain customer's SIMMs.
Cannot double-click to open a disk, application, or server	1. Remove extra system files on hard disk. 2. Clear parameter RAM. Hold down <Option> <Command> <R> and <P> keys during system startup. Reset mouse controls. 3. If mouse was connected to a keyboard, connect mouse to a rear ADB port. If mouse works, replace keyboard. If mouse does not work in any ADB port, replace mouse. 4. Replace logic board. Retain customer's SIMMs.
Known-good serial printer will not print	1. Make sure system software is version 7.01 or later. 2. Make sure Chooser settings are correct. 3. Replace printer interface cable. 4. Replace logic board. Retain customer's SIMMs.
Known-good printer on AppleTalk network does not print	1. Make sure system software is version 7.01 or later. 2. Make sure Chooser settings are correct. 3. Refer to *Networks* tab in *Apple Service Technical Procedures*.

Miscellaneous Problems	Solutions
No sound from speaker	1. Make sure speaker volume setting in the Sound control panel is one or above. 2. Replace speaker. 3. Replace logic board. Retain customer's SIMMs.

Macintosh Quadra 900
Specifications

Microprocessor	MC68040 microprocessor with integrated floating-point unit, memory management unit, and memory cache 25 MHz clock frequency Runs System 7.0.1 or later
Memory	4 MB of DRAM, expandable to 64 MB (80 ns or faster SIMMs) 1 MB of VRAM, expandable to 2 MB 1 MB of ROM
Built-in Video	Built-in 8-bit video circuitry (upgradable to 24-bit) supports all Apple monitors and many non-Apple monitor types (NTSC, PAL, VGA)
Interfaces	Sound-out port (mini phone jack) Sound input port (mini phone jack) Two line input ports (RCA phono jack) Apple Desktop Bus (ADB) port (mini DIN-4) Printer port (mini DIN-8) Modem port (mini DIN-8) SCSI port (DB-25) Ethernet port Video port (DB-13)
Internal Storage	1.4 MB Apple SuperDrive Optional 160 MB or 400 MB SCSI hard drive
Sound	Sound output: built-in speaker and 8-bit or 16-bit stereo sound Sound input: 8-bit monaural sound input with microphone and two line-in connectors (accepting input from CD player, VCR, etc.); real-time decompression hardware
Clock/Calendar	ASIC clock chip with PRAM and DFAC support and with seven-year lithium battery
Electrical	Line voltage: 100 to 120 VAC Frequency: 50 to 60 Hz, single phase Maximum power: 303 watts

Macintosh Quadra 900
DRAM SIMM Upgrade

The Macintosh Quadra 900 ships with four 1 MB DRAM SIMMs on the logic board. You can increase the amount of memory (up to 64 MB) by installing additional SIMMs in any of the remaining SIMM slots and/or by replacing the original 1 MB SIMMs with larger 4 MB SIMMs.

DRAM Upgrade Procedure

The Macintosh Quadra 900 has four banks of DRAM SIMM sockets (Banks A, B, C, and D). Each bank contains four slots. When installing DRAM SIMMs in the Macintosh Quadra 900, the following rules apply:

- Use DRAM SIMMs that are 80 ns or faster (SIMMs with slower ratings will cause serious timing problems and system crashes).
- Fill each bank with DRAM SIMMs or leave each bank empty.
- A filled bank must have four DRAM SIMMs of the same size (four 1 MB SIMMs or four 4 MB SIMMs).

To install a SIMM, hold it by its edges with the contacts pointing down. Insert the SIMM at an angle (bottom forward) into the SIMM slot. Push back on the top corners of the SIMM. You will hear a click when the SIMM snaps into place.

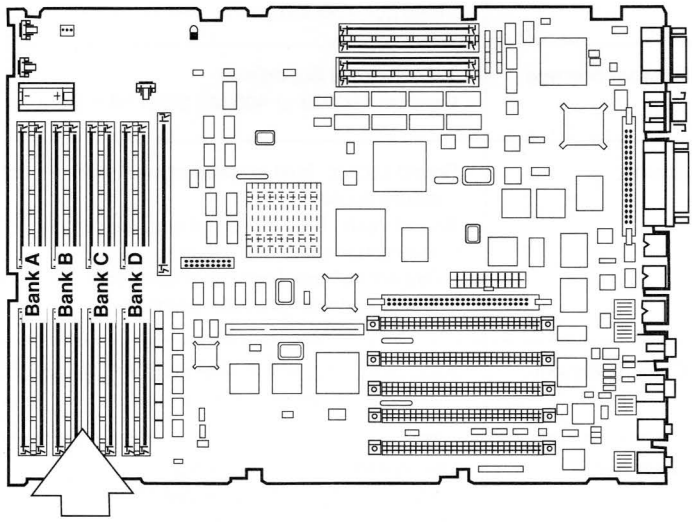
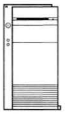


Figure: DRAM SIMM Slots on the Logic Board

Macintosh Quadra 900
VRAM SIMM Upgrade



The Macintosh Quadra 900 ships with 1 MB of VRAM soldered on the logic board. You can increase the amount of VRAM to 2 MB by installing additional VRAM SIMMs, as the following procedure explains.

VRAM Upgrade Procedure

The Macintosh Quadra 900 has two VRAM SIMM sockets (J3 and J4). Each socket can hold up to two 256K VRAM SIMMs. When installing VRAM SIMMs in the Macintosh Quadra 900, the following rules apply:

- Use VRAM SIMMs that are 100 ns or faster (SIMMs with slower ratings will cause video timing problems).
- Fill both VRAM SIMM sockets or leave both sockets empty.
- Filled SIMM sockets must contain four 256K VRAM SIMMs.

To install a SIMM, hold it by its edges with the contacts pointing down. Insert the SIMM at an angle (bottom forward) into the SIMM slot. Push back on the top corners of the SIMM. You will hear a click when the SIMM snaps into place.

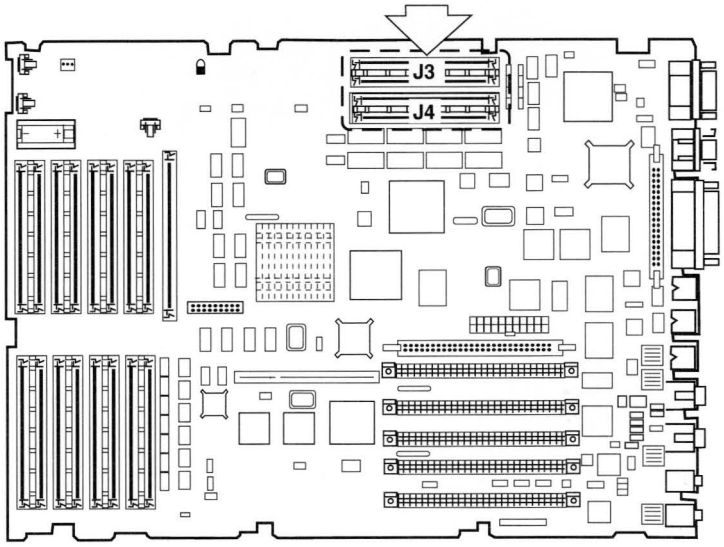


Figure: VRAM SIMM Slots on the Logic Board

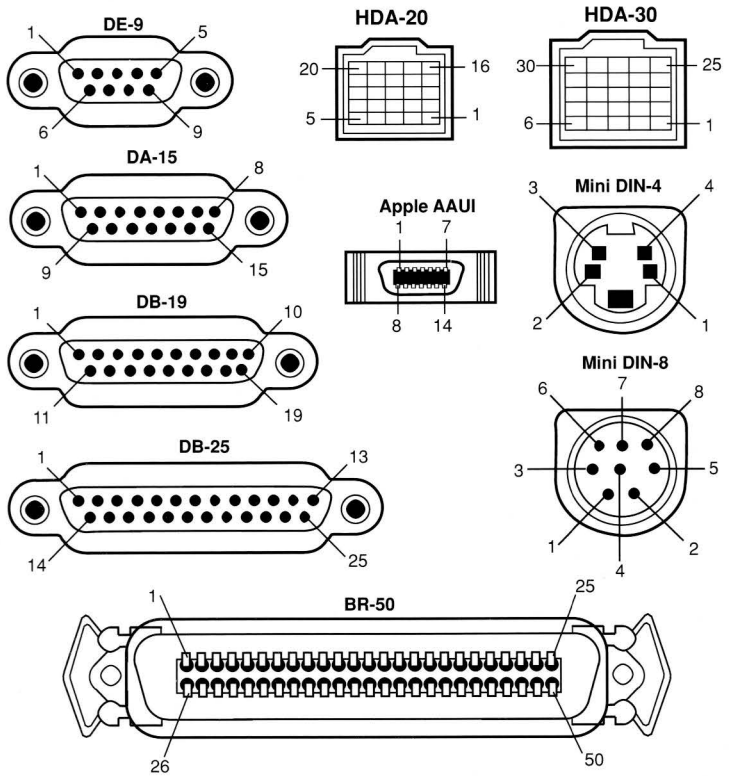
General Information

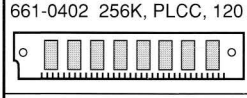
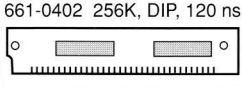
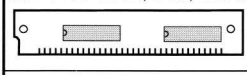
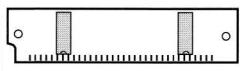
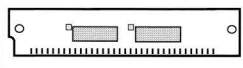
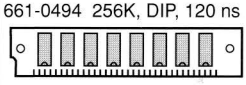
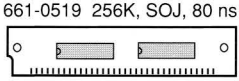
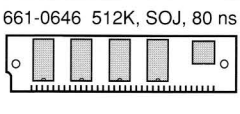
Table of Contents

Contents **Page**

Cable Connectors

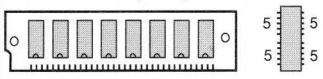
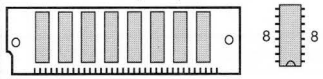
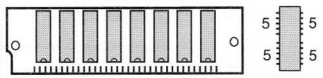
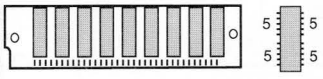
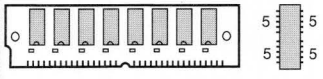
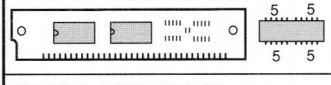
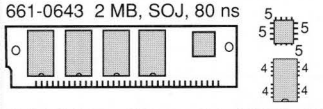
The pin numbers shown below are for the connectors attached to the ends of the Macintosh peripheral cables, as viewed from the front of the connector.



DRAM SIMMs for CPUs Service Exchange Modules	Plus	Classic	Classic II	SE	SE/30	LC	II	IIx	IIfx	IIsi	IIcx	IIci	Quadra 700	Quadra 900
	Macintosh Computers													
661-0402 256K, PLCC, 120 ns 	●	●		●	●		●	●			●			
661-0402 256K, DIP, 120 ns 	●	●		●	●		●	●			●			
661-0402 256K, SOJ, 120 ns 	●	●		●	●		●	●			●			
661-0402 256K, SOJ, 120 ns 	●	●		●	●		●	●			●			
661-0402 256K, SOJ, 120 ns 	●	●		●	●		●	●			●			
661-0494 256K, DIP, 120 ns 	●	●		[1]	[2]		●	●			●			
661-0519 256K, SOJ, 80 ns 	●	●		●	●		●	●		●	●	●		
661-0646 512K, SOJ, 80 ns 										●		●		
Slowest acceptable DRAM speed (ns)	150	120	100	150	120	100	120	120	80	100	120	80	80	80

[1] Can be installed only in SIMM positions 3 and 4 because of space constraints.

[2] Can be installed only in SIMM Bank A because of space constraints.

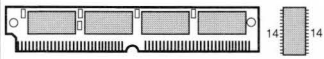
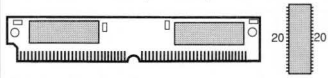
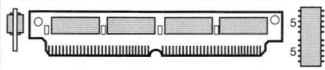
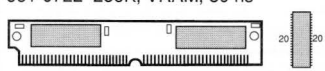
DRAM SIMMs for CPUs Service Exchange Modules	Macintosh Computers													
	Plus	Classic	Classic II	SE	SE/30	LC	II	IIx	IIfx	IIsi	IIcx	IIci	Quadra 700	Quadra 900
661-0403 1 MB, SOJ, 120 ns 	●	●		●	●		●	●			●			
661-0410 1 MB, DIP, 120 ns 		●		[1]	[2]		●	●			●			
661-0520 1 MB, SOJ, 80 ns 	●	●	●	●	●	●	●	●		●	●	●	●	●
661-0546 1 MB, SOJ, 80 ns, Parity 	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]		[3]	[3]	●	[3]	[3]
661-0548 1 MB, SOJ, 80 ns, 64-Pin 									●					
661-0719 1 MB, SOJ, 80 ns 			●		●	●				●	●	●	●	●
661-0643 2 MB, SOJ, 80 ns 			●			●				●		●		
Slowest acceptable DRAM speed (ns)	150	120	100	150	120	100	120	120	80	100	120	80	80	80

[3] The SIMM is compatible with the CPU, but the CPU does not use the parity feature of this SIMM.

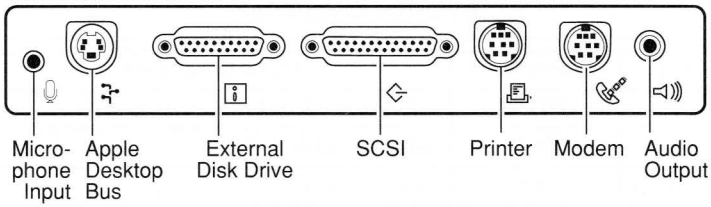
DRAM SIMMs for CPUs Finished Goods Only [4]	Macintosh Computers													
	Plus	Classic	Classic II	SE	SE/30	LC	II	IIx	IIfx	IIsi	IIcx	IIci	Quadra 700	Quadra 900
661-0402 256K, DIP, 120 ns 	●			[1]										
661-0403 1 MB, SOJ, 120 ns 					●			●						
Slowest acceptable DRAM speed (ns)	150	120	100	150	120	100	120	120	80	100	120	80	80	80

[1] Can be installed only in SIMM positions 3 and 4 because of space constraints.

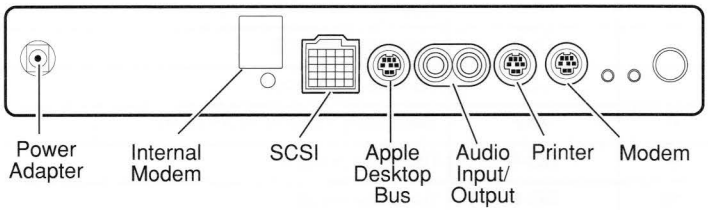
[4] Apple substitutes a compatible service exchange module for finished-goods SIMMs. You will not receive a finished-goods SIMM as a service exchange module.

Video Display SIMMs	Macintosh Computers													Cards	
	Plus	Classic	Classic II	SE	SE/30	LC	II	IIx	IIfx	IIsi	IIcx	IIci	Quadra 700	Quadra 900	4 • 8	8 • 24 GC
661-0649 512K, VRAM, 100 ns 						●										
661-0609 256K, VRAM, 100 ns 						●							●	●	●	
661-0610 1 MB, DRAM, 100 ns 																●
661-0722 256K, VRAM, 80 ns 						●							●	●	●	

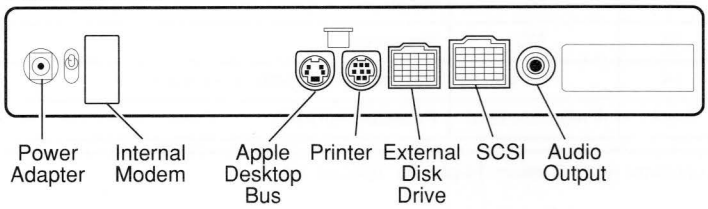
Macintosh Classic II



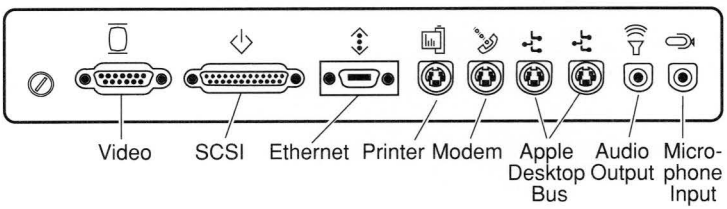
PowerBook 140/170



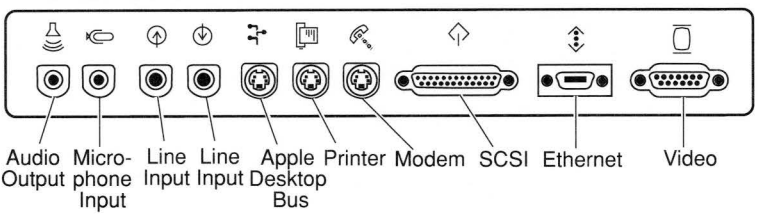
PowerBook 100



Macintosh Quadra 700



Macintosh Quadra 900



Ethernet Connector

Pin	Signal Name	Signal Description
1	FN Pwr	+12 volts @ 175 mA or +5 volts @ 420 mA
2	DI-A	Data In circuit A
3	DI-B	Data In circuit B
4	VCC	Voltage common
5	CI-A	Control In circuit A
6	CI-B	Control In circuit B
7	+5V	+5 volts (from host)
8	+5V	Secondary +5 volts (from host)
9	DO-A	Data Out circuit A
10	DO-B	Data Out circuit B
11	VCC	Secondary voltage common
12	NC	Reserved
13	NC	Reserved
14	FN Pwr	Secondary +12 volts or +5 volts
Shell	Protective Gnd	Protective ground

Connector type: Custom 14-pin .05" spaced ribbon

This connector is present on the Macintosh Quadra 700 and Quadra 900.

External Disk Drive Connector – HDI-20

Pin	Signal Name	Signal Description
1	GND	Signal ground
2	GND	Signal ground
3	GND	Signal ground
4	GND	Signal ground
5	NC	No connection
6	+5V	+5 volts DC
7	+5V	+5 volts DC
8	+5V	+5 volts DC
9	+5V	+5 volts DC
10	NC	No connection
11	PH0	Phase 0
12	PH1	Phase 1
13	PH2	Phase 2
14	PH3	Phase 3
15	WREQ/	Write request
16	HDSEL	Head select
17	ENBL2/	External drive select
18	RD	Read data
19	WR	Write data
20	NC	Not connected

Connector: 20-pin high-density interconnect (HDI-20)

This connector is present on the PowerBook 100.

SCSI Connector – HDI-30 (Pins 1-15)

Pin	Signal Name	Signal Description
1	SCSI–Mode/	SCSI disk mode enable signal
2	Data0/	Data bit 0
3	GND	Signal ground
4	Data1/	Data bit 1
5 *	Termpwr	+5 volts termination power
6	Data2/	Data bit 2
7	Data3/	Data bit 3
8	GND	Signal ground
9	ACK/	Acknowledge
10	GND	Signal ground
11	Data4/	Data bit 4
12	GND	Signal ground
13	GND	Signal ground
14	Data5/	Data bit 5
15	GND	Signal ground

* Termination power is not provided on the PowerBook 100.

SCSI Connector – HDI-30 (Pins 16-30)

Pin	Signal Name	Signal Description
16	Data6/	Data bit 6
17	GND	Signal ground
18	Data7/	Data bit 7
19	PARITY/	Data parity
20	GND	Signal ground
21	REQ/	Request
22	GND	Signal ground
23	BUSY/	Busy
24	GND	Signal ground
25	ATN/	Attention
26	C/D/	Control/data
27	RST/	Reset
28	MSG/	Message
29	SEL/	Select
30	I/O/	Input/output

Connector: 30-pin high-density interconnect (HDI-30)

This connector is present on the PowerBook 100, 140, and 170.

Apple Keyboard 661-0383
Apple Keyboard, French Canadian C661-0383
Apple Keyboard, Spanish E661-0383
Apple Keyboard Parts
- Alps Locking Keyswitch 970-1263
- Bottom Case 815-1017
- Key Cap Set 658-7011
- Keyboard Cable, 1 meter 590-0361
- Keyboard Cable, 2 meter 590-0152
- Keyswitch Set, ADB Kybd, Tan Plunger (Set of 10) 076-0209
- Keyswitch Set, ADB Kybd, White Plunger (Set of 10) 076-0387
- Top Case 815-1016

Apple Keyboard II 661-0603
Apple Keyboard II, Arabic* AB661-0603
Apple Keyboard II, British* B661-0603
Apple Keyboard II, Danish* DK661-0603
Apple Keyboard II, French* F661-0603
Apple Keyboard II, French Canadian C661-0603
Apple Keyboard II, German* D661-0603
Apple Keyboard II, Greek* GR661-0603
Apple Keyboard II, Hebrew* HB661-0603
Apple Keyboard II, Icelandic* SK661-0603
Apple Keyboard II, International* Z661-0603
Apple Keyboard II, Italian* T661-0603
Apple Keyboard II, Japanese JA661-0603
Apple Keyboard II, Korean KH661-0603
Apple Keyboard II, Norwegian* H661-0603
Apple Keyboard II, Portugese* PO661-0603
Apple Keyboard II, Persian* PS661-0603
Apple Keyboard II, Spanish* Y661-0603
Apple Keyboard II, Swedish* S661-0603
Apple Keyboard II, Swiss* SF661-0603
Apple Keyboard II, Taiwanese TA661-0603
Apple Keyboard II, Turkish* TU661-0603
Apple Keyboard II, Western Spanish E661-0603
Apple Keyboard II, Yugoslavian* YU661-0603
Apple Extended Keyboard 661-0384
Apple Extended Keyboard, French F661-0384
Apple Extended Keyboard, French Canadian C661-0384
Apple Extended Keyboard, German D661-0384
Apple Extended Keyboard, Italian T661-0384
Apple Extended Keyboard, Spanish E661-0384
Apple Extended Keyboard Parts
- Bottom Case 815-1019
- Key Cap Set 658-7010
- Keyboard Cable, 1 meter 590-0361
- Keyswitch, Alps Locking 970-1263

***These keyboards are not available in the United States.**

Keyswitch Set, ADB Kybd, Tan Plunger (Set of 10) 076-0209
Keyswitch Set, ADB Kybd, White Plunger (Set of 10) 076-0387
Top Case 815-1018
Apple Extended Keyboard II 661-0543
Apple Extended Keyboard II, ISO, French EF661-0544
Apple Extended Keyboard II, ISO, French Canadian EC661-0544
Apple Extended Keyboard II, ISO, German ED661-0544
Apple Extended Keyboard II, ISO, Italian ET661-0544
Apple Extended Keyboard II, ISO, Spanish EE661-0544
Apple Extended Keyboard II Parts
Bottom Case 658-5211
Foot, Front 865-0057
Foot, Rear, Adjustable 865-1139
Foot Pad, Rear 865-0067
Key Cap Set 658-7010
Keyboard Cable, 1 meter 590-0361
Keyswitch, Alps Locking 970-1263
Keyswitch Set, ADB Kybd, Tan Plunger (Set of 10) 076-0209
Keyswitch Set, ADB Kybd, White Plunger (Set of 10) 076-0387
Spring, Foot Return 870-0030
Template 001-0017
Top Case 658-5210
Apple ISO Keyboard, French F661-0454
Apple ISO Keyboard, German D661-0454
Apple ISO Keyboard, Italian T661-0454

Mouse, ADB (replaced by 661-0479) 661-0338
Mouse Ball (25.4 mm dia), gray 699-8001
Mouse Ball (21.9 mm dia), black 699-8038
Retainer, ADB Mouse (38 mm dia) 076-0231
Retainer, ADB Mouse (34 mm dia) 815-0816
Mouse, ADB (replacing part number 661-0338) 661-0479
Mouse Ball 815-1135
Retainer, ADB Mouse 815-1136

When returning a defective module to Apple, always enter on the SRO form the symptom code that best describes the problem. Do this as follows:

1. Locate and note the three-digit symptom code from the Module Symptom Codes chart.
2. Select the appropriate modifier code from the table below. This is the fourth digit of the symptom code.
3. Write the four-digit code on the SRO form.

For example: *A Macintosh logic board crashes after being on for an hour or more. The symptom code is 153, "System bombs or crashes." The board fails after it has been in use for awhile, so the modifier code is 4. Place the modifier code after the symptom code, and enter the error code 1534 on the SRO form.*

Modifier Codes

Code	Modifier
1	Continuous
2	Intermittent
3	Environmental / cannot duplicate symptom
4	Always fails after awhile
5	Depends on configuration
6	Fails only with application software
7	Noisy
8	Inoperable upon first use

Startup/run Problems	
150	Bad or no startup tone
151	Screen bright, no Mac face
152	Sad Mac/self-test fail/startup error
153	System bombs or crashes
154	No power light indicator with good power supply
155	Restarts or shuts down randomly
156	Can't shut down
Video/Sound Problems	
160	Bad or no color on display
161	Distorted or no video; system boots OK
162	Distorted or no sound; system boots OK
I/O Device Problems	
170	Bad or no response (kybd, mouse, trackball...)
171	Good game paddle/joystick fails
172	Serial port failures
173	Printing or AppleTalk problem
174	Communications or modem port problems
175	Bad expansion slots (Apple II, Direct, NuBus...)
Disk I/O Errors	
180	Can't boot/read internal floppy disk
181	Can't boot/read external floppy disk
182	Can't write/format internal floppy disk
183	Can't write/format external floppy disk
184	Can't boot/read internal SCSI drive
185	Can't boot/read external SCSI drive
186	Can't write/format internal SCSI drive
187	Can't write/format external SCSI drive
Miscellaneous Problems	
190	Control Panel settings don't work
191	Connector or jack problems
192	SIMM socket problems
193	Board is cracked, damaged
194	Bad battery

CRT & Analog Boards	
250	Black screen
251	Vertical bright line
252	Horizontal bright line
253	Rolls vertically
254	Diagonal stripes
255	Dim or low intensity
256	Fuzzy screen, unclear characters
257	Unstable picture; logic board OK
258	Incorrect picture size or alignment
259	Lighted screen, no picture
260	Fan not spinning
261	Color not adjustable; no color
262	Distorted sound
263	No power; no raster
Drives	
350	Won't eject
351	Won't format
352	Disk does not spin
353	Too many bad blocks
354	Won't mount
355	Won't reconize disk formatted on other drive
356	Won't read/write data; disk spins
357	Won't write data
358	Excessive read/write errors
359	Won't boot; reads/writes OK
360	Excessive seeking
361	Icon doesn't appear on desktop, formats OK
362	Won't format; able to see drive in SC setup
363	Won't format; unable to see drive in SC setup
364	Unable to access drive; system folder present
365	Noisy; works OK

Power Supplies	
450	Clicking noise
451	Fuses keep blowing
452	Causes system failure
453	Noisy; works OK
454	No power
455	System randomly resets
Keyboards, Mouse, Input Devices	
550	No or bad response
551	Bad keyswitch or button
552	Foreign substance spilled on unit
553	Sticky or bouncing keys
554	No cursor response
Printers	
650	Improper print head movement
651	Paper will not feed
652	Self-test OK; will not print from host
653	Fails self-test
654	Will not select from front panel
655	Printer not seen in Chooser
656	Prints blank pages
657	Prints black pages
658	Print is distorted or uneven
659	Indicator light suggests fault
660	No power light

Phone/Address

Directory

Name Address	Phone

Apple Phone Numbers

Credits

Apple Technical Assistance Center

408-879-0220

Customer Service Administration

408-559-6444

Apple Service Account # (Filled in by service provider)

☐☐-☐☐☐☐☐☐-☐☐

Send your Comments and Suggestions to:

Applelink: ASG

This Apple manual was written, edited, and composed on Apple Macintosh computers. Proof pages were created on Apple LaserWriter and Linotronic Printers. Pre-press work done electronically on a Macintosh based system. Produced direct disk to film output from an in position pagination program. The following software programs were used in the creation of Volume II of the Apple Service Guide: Aldus PageMaker®, Aldus FreeHand®, and Adobe Illustrator®.

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Lead Writer: Dave Thoms
Writers: Cookie Smith, Katherine Yagel, Casey Conroy, Kay Tierney
Editor: Hunter Greer
Graphic Designers: Steve Rancourt, Irene Welch
Production: Laura Ashby

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