



Macintosh II/IIx/IIfx

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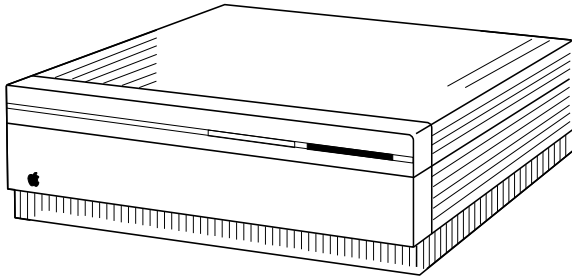


## Basics

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Macintosh II/IIx/IIfx





**Figure: Macintosh II, IIx, IIcx**

## Overview

This manual includes complete repair procedures for the Macintosh II, Macintosh IIx, and Macintosh IIcx.





## Specifications

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Macintosh II/IIx/IIfx





# Processor

## CPU

**Macintosh II**

Motorola 68020 microprocessor

15.6772 MHz

Optional built-in paged memory management unit (PMMU)

**Macintosh IIx**

Motorola 68030 microprocessor

15.6772 MHz

Built-in paged memory management unit (PMMU)

**Macintosh IIfx**

Motorola 68030 microprocessor

40 MHz

Built-in paged memory management unit (PMMU)





## Coprocessor

**Macintosh II** Motorola 68881 math coprocessor

**Macintosh IIx/IIfx** Motorola 68882 math coprocessor

## Addressing

32-bit registers

32-bit address bus

32-bit data bus





# Memory

## RAM

<b>Macintosh II/Ix</b>	1 MB, expandable to 8 MB
<b>Macintosh IIfx</b>	4 MB standard, expandable to 8 MB

## ROM

<b>Macintosh II/Ix</b>	256K
<b>Macintosh IIfx</b>	512K





## Disk Storage

### Floppy Drive

#### Macintosh II

Internal 800K floppy drive  
Optional second internal 800K floppy drive  
Optional internal 1.4 MB floppy drive upgrade

#### Macintosh IIx/IIfx

Internal 1.4 MB floppy drive  
Optional second internal 1.4 MB floppy drive

### Hard Drive

Optional internal 40, 80, or 160 MB hard drive







## I/O Interfaces

### **Expansion**

Processor-direct slot (PDS)

### **SCSI**

5 MB/sec. transfer rate  
Eight device maximum

### **Apple Desktop Bus**

Two ADB ports allow daisy-chaining of peripheral devices

### **Serial**

Two RS-232/RS-422 serial ports; mini DIN-8 connectors

### **NuBus**

Six internal NuBus slots support full 32-bit address and data buses





## Sound and Video

### **Sound Generator**

Apple's custom digital sound chip provides 8-bit stereo sampling at 44.1 kHz and includes four-voice, wavetable synthesis; capable of driving stereo headphones or other stereo equipment through the sound jack.





## Electrical

**Line Voltage** 100–240 VAC, automatically configured

**Frequency** 48–62 Hz, single phase

### **Maximum Power**

**Macintosh II/Ix** 220 W (not including monitor power)

**Macintosh IIfx** 230 W (not including monitor power)





## Physical

### **Dimensions**

Height: 5.5 in. (14.0 cm)

Width: 18.7 in. (47.4 cm)

Depth: 14.4 in. (36.5 cm)

### **Weight**

24 lb. (10.9 kg)

Weight will be greater with internal hard drive.





# Troubleshooting

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## Macintosh II/IIx/IIfx





## General

The Symptom Charts included in this chapter will help you diagnose specific symptoms related to your product. Because cures are listed on the charts in the order of most likely solution, try the first cure first. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next cure. (Note: If you have replaced a module, reinstall the original module before you proceed to the next cure.)

If you are not sure what the problem is, or if the Symptom Charts do not resolve the problem, refer to the Flowchart for the product family.

For additional assistance, contact Apple Technical Support.





# Symptom Charts

## **Error Chord**

Error chord sounds during startup sequence

- 1 Perform SIMM verification on customer's logic board. Replace Apple-labeled SIMMs manufactured by NEC that have date code of 9052 or below.
- 2 Replace logic board. Retain customer's SIMMs.





## System

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 Check batteries. Refer to “Battery Verification” in Additional Procedures.
- 5 Replace power supply.
- 6 Replace logic board. Retain customer’s SIMMs.

Clicking, chirping,  
or thumping

- 1 Remove additional NuBus cards.
- 2 Replace power supply.
- 3 Replace logic board. Retain customer’s SIMMs.







## System (Continued)

System shuts down  
intermittently

- 1 Make sure air vents on sides and top of case are unobstructed. Thermal protection circuitry may shut down system. After 30–40 minutes, system should be OK.
- 2 Replace power cord.
- 3 Check batteries. Refer to “Battery Verification” in Additional Procedures.
- 4 Replace power supply.
- 5 Replace logic board. Retain customer’s SIMMs.

System  
intermittently  
crashes or locks

- 1 Make sure system software is correct version.
- 2 Make sure software is known-good.
- 3 Remove additional RAM and NuBus cards.
- 4 Replace logic board. Retain customer’s SIMMs.
- 5 Replace SIMMs.
- 6 Replace power supply.





## **System (Continued)**

System doesn't boot

Replace Apple-labeled SIMMs manufactured by NEC that have date code of 9052 or below.





## Video

Screen is black, audio and drive operate, fan is running, and LED is lit

- 1 Adjust brightness on monitor.
- 2 Verify monitor works with another Macintosh.
- 3 Replace monitor. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 4 Replace video cable.
- 5 Move video card to different slot.
- 6 Replace video card. Refer to Video Cards manual.
- 7 Replace SIMMs.
- 8 Replace logic board. Retain customer's SIMMs.
- 9 Replace power supply.





## Video (Continued)

Screen is black, audio and drive do not operate, but fan is running and LED is lit

- 1 Replace video cable.
- 2 Move video card to different slot.
- 3 Verify monitor works with another Macintosh.
- 4 Replace video card. Refer to Video Cards manual.
- 5 Replace SIMMs.
- 6 Replace logic board. Retain customer's SIMMs.
- 7 Replace power supply.
- 8 Replace monitor. Refer to appropriate monitor manual to troubleshoot defective monitor.





## Video (Continued)

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 batteries. Refer to “Battery Verification” in Additional Procedures.
- 3 Replace power supply.
- 4 Replace logic board. Retain customer’s SIMMs.

Video display exhibits ghosting

Replace Apple-labeled SIMMs manufactured by NEC that have date code of 9052 or below.

System boots and then loses video

Replace Apple-labeled SIMMs manufactured by NEC that have date code of 9052 or below.





## Video (Continued)

Partial or whole screen is bright and audio is present, but no video information is visible

- 1 Verify monitor works with another Macintosh.
- 2 Replace monitor. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 3 Replace video cable.
- 4 Move video card to different slot.
- 5 Replace video card. Refer to Video Cards manual.
- 6 Replace logic board. Retain customer's SIMMs.





## Floppy Drive

Internal floppy drive runs continuously

- 1 Replace bad 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 one internal floppy drive does not operate

- 1 Replace bad 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.





## Floppy Drive (Continued)

Audio and video are present, but neither internal floppy drive operates

- 1 Replace bad disk.
- 2 Verify that all external SCSI devices are disconnected.
- 3 Replace logic board. Retain customer's SIMMs.
- 4 Replace power supply.

Disk ejects; display shows icon with blinking "X"

- 1 Replace 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.

Will not eject disk

- 1 Switch power off and hold mouse button down while switching power back on.
- 2 Replace internal floppy drive.







## Floppy Drive (Continued)

Attempts to eject disk but doesn't

- 1 Reinsert disk.
- 2 Reseat top cover so drive slots align correctly.

MS-DOS drive does not recognize disk formatted on 1.4 MB drive

To read and write files with either MS-DOS or 1.4 MB drive, format all disks with MS-DOS drive first.





## Hard Drive

Internal hard drive will not operate; LED doesn't light; drive doesn't spin

- 1 Remove hard drive data cable.
- 2 Replace internal hard drive power cable.
- 3 Verify +5V and 12V lines to hard drive.
- 4 Replace internal hard drive.
- 5 Replace logic board. Retain customer's SIMMs.

Works with internal hard drive or external SCSI device but not with both

- 1 Verify that SCSI device switch setting on external device isn't 0 (internal hard drive address) or 7 (computer address).
- 2 Verify proper SCSI termination. Refer to "SCSI Termination" in Additional Procedures.
- 3 Replace SCSI terminator on external device.
- 4 Troubleshoot external SCSI device.





## Hard Drive (Continued)

Drive icon does not appear on desktop

Verify proper SCSI termination. Refer to “SCSI Termination” in Additional Procedures.

Data is lost or corrupted

Verify proper SCSI termination. Refer to “SCSI Termination” in Additional Procedures.





## Peripherals

Cursor does not move

- 1 Check mouse connection.
- 2 Inspect inside of mouse for buildup of dirt and other contaminants. Clean mouse if necessary.
- 3 If mouse was connected to keyboard, connect it to rear ADB port instead. If mouse works, replace keyboard.
- 4 If mouse does not work in any ADB port, replace mouse.
- 5 Reset PRAM.
- 6 Remove additional NuBus cards.
- 7 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.





## Peripherals (Continued)

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.

Double-click doesn't open application, disk, or server

- 1 Remove multiple system files on hard drive.
- 2 Clear parameter RAM. System 7: Hold down <Command> <Option> <P> <R> during startup but before "Welcome to Macintosh" appears. System 6 and earlier: Hold down <Command> <Option> <Shift> keys and select Control Panel from Apple menu.
- 3 If mouse was connected to keyboard, connect it to rear ADB port instead. If mouse works, replace keyboard.
- 4 If mouse does not work in any ADB port, replace mouse.
- 5 Replace logic board. Retain customer's SIMMs.





## Peripherals (Continued)

Known-good  
ImageWriter or  
ImageWriter II will  
not print

- 1 Make sure system software is correct version.
- 2 Make sure that Chooser and Control Panel settings are correct.
- 3 Reset PRAM.
- 4 Replace printer interface cable.
- 5 Replace logic board. Retain customer's SIMMs.

Known-good  
LaserWriter will not  
print

- 1 Make sure system software is correct version.
- 2 Make sure that Chooser and Control Panel settings are set correct.
- 3 Reset PRAM.





## Miscellaneous

No sound from speaker

- 1 Verify that volume setting in Control Panel is set to 1 or above.
- 2 Reset PRAM.
- 3 Replace speaker.
- 4 Replace logic board. Retain customer's SIMMs.

System hangs when first application launches

Replace Apple-labeled SIMMs manufactured by NEC that have date code of 9052 or below.

System displays ID error and then locks

Replace Apple-labeled SIMMs manufactured by NEC that have date code of 9052 or below.





Take Apart

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Macintosh II/IIx/IIfx



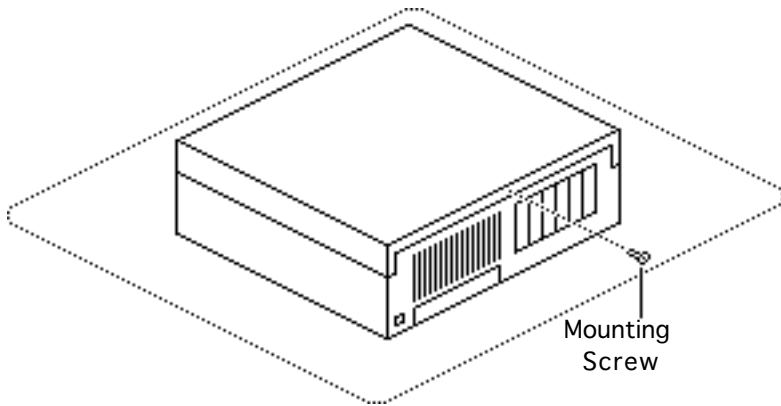


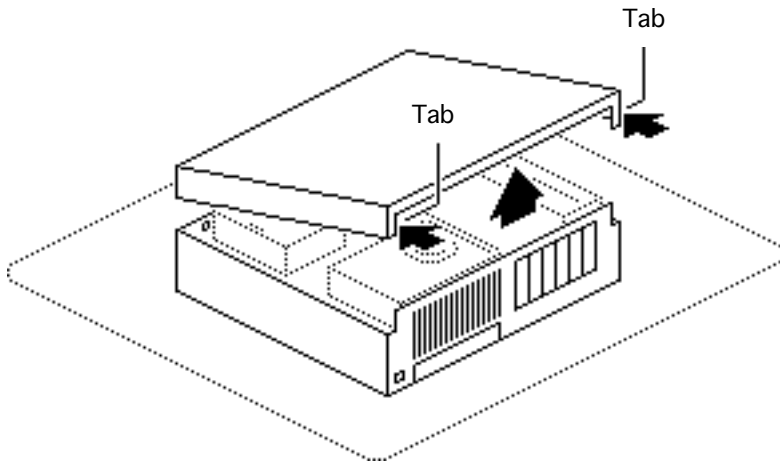


## Cover

No preliminary steps are required before you begin this procedure.

- 1 Remove the cover mounting screw.

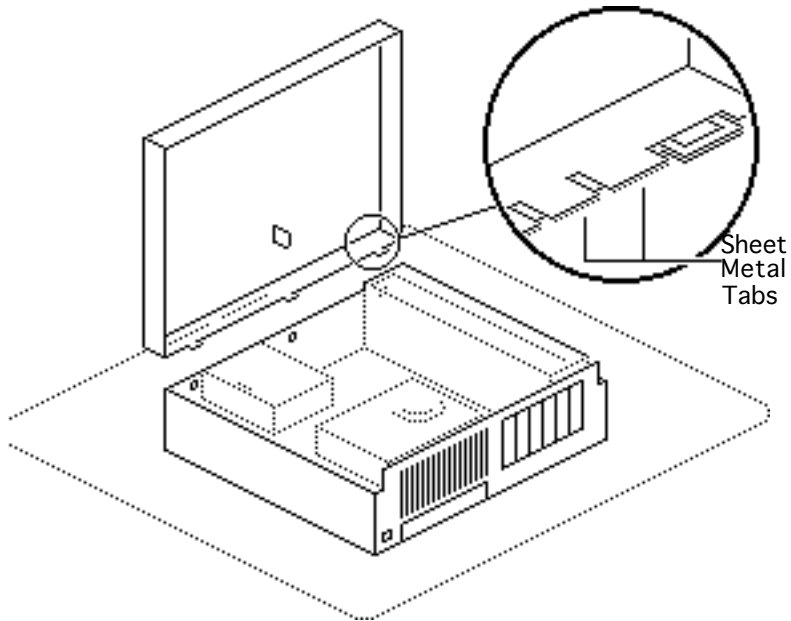




- 2 **Caution:** Do not rotate the cover more than 45 degrees or you could damage the floppy drives.

Push in the tabs at the rear of the computer and lift the cover, back first, from the computer.





**Replacement Caution:**

Before replacing the cover, make sure none of the sheet metal tabs on the inside of the cover are bent inward, toward the center of the cover.

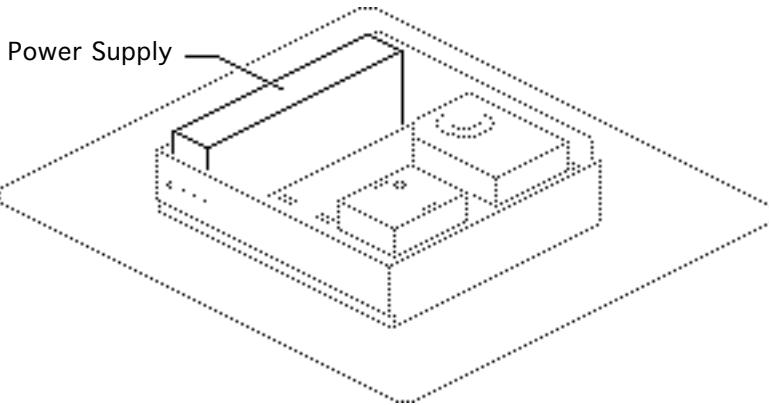


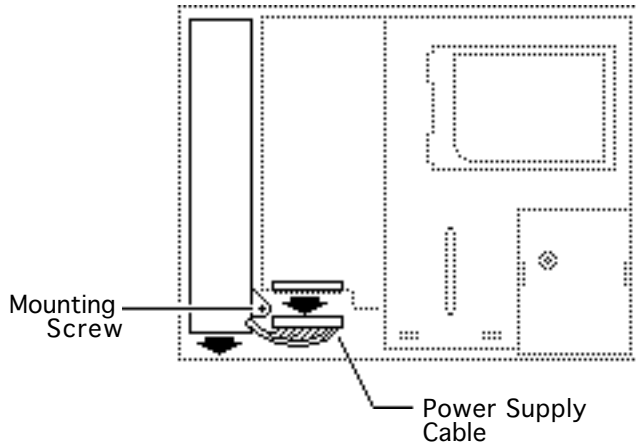


## Power Supply

Before you begin, remove the cover.

**Caution:** Review the ESD precautions in Bulletins/Safety.





- 1 Disconnect the power supply cable from the logic board.
- 2 Remove the screw that holds the power supply in place.
- 3 Slide the power supply toward the front of the case and lift the power supply, front first, from the case.



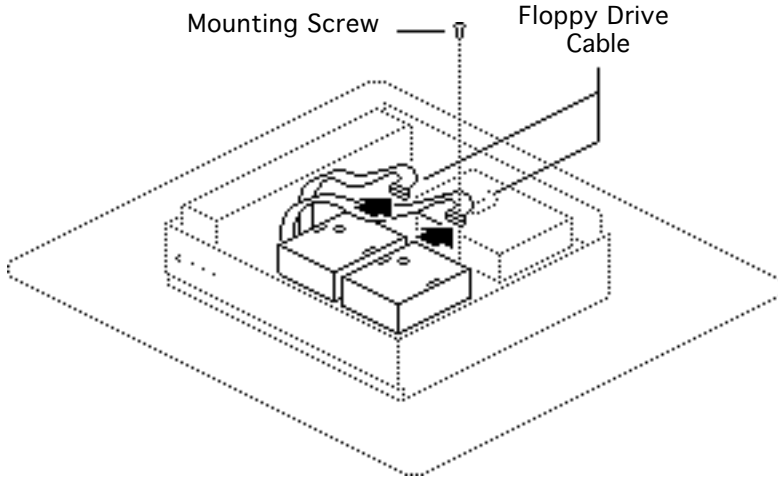


## Floppy Drive

Before you begin, remove the cover.

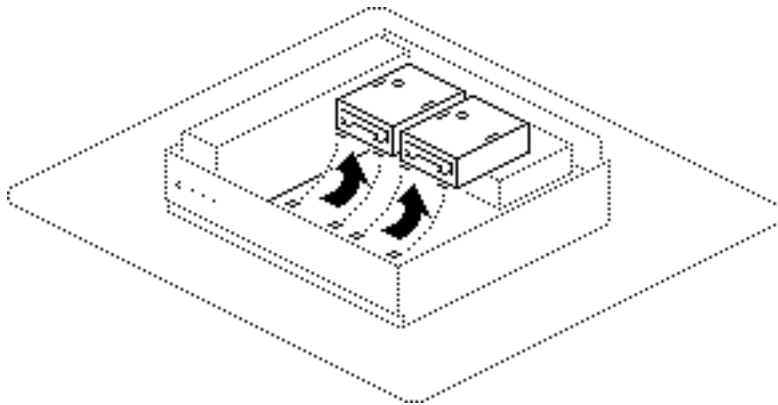
**Caution:** Review the ESD precautions in Bulletins/ Safety.

- 1 Disconnect the floppy drive cable from the floppy drive you want to remove.
- 2 Remove the screw that holds the drive in place.





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



**Replacement Note:** Apple recommends using dust shields on 1.4 MB SuperDrives. All 1.4 MB replacement drives ship with the dust shield already installed. If you plan to install a dust shield on the current drive, you must first clean the drive.

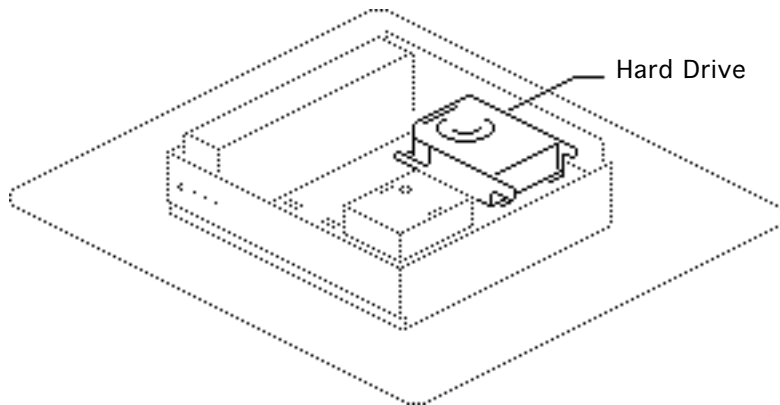




## Hard Drive

Before you begin, remove the cover.

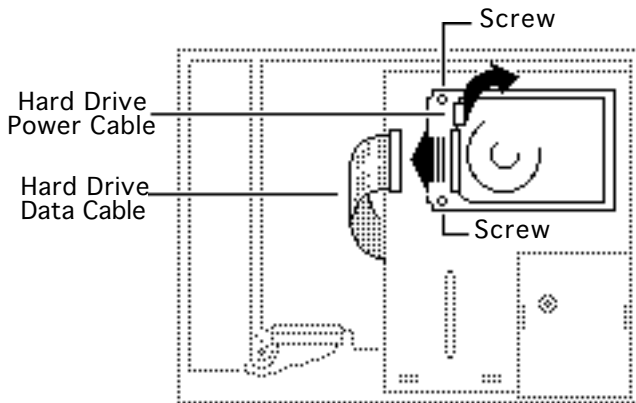
**Caution:** Review the ESD precautions in Bulletins/Safety.







- 1 Disconnect the hard drive power cable and hard drive data cable from the hard drive.



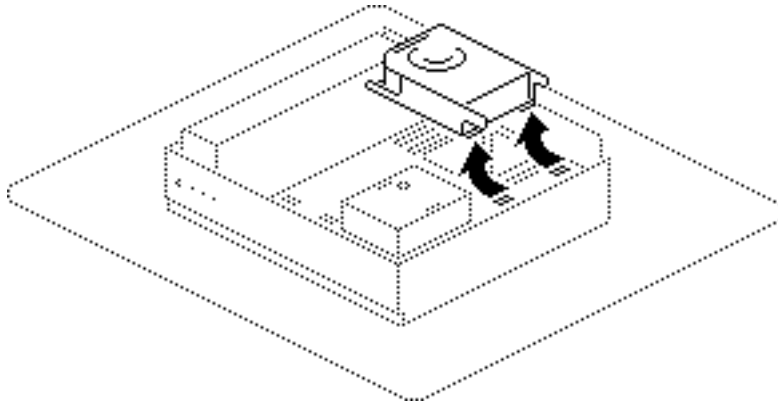
**Note:** Remove the SCSI filter, if installed. Refer to “SCSI Termination” in Additional Procedures.

- 2 Remove the two screws that hold the drive in place.





- 3 Lift the rear of the drive, slide it toward the power supply, and lift the drive off the drive mount.

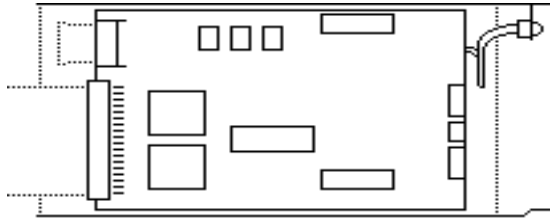


**Replacement Note:** For information on removing the hard drive from the carrier and returning drives, cables, and carriers to Apple, refer to Additional Procedures in the Hard Drives manual.

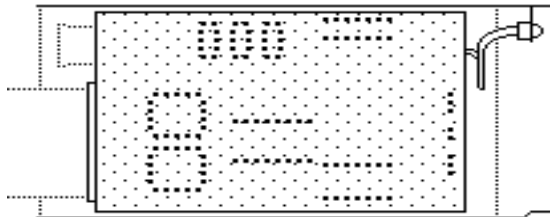




Revision A  
(Component-Side Up)



Revision B  
(Solder-Side Up)



**Replacement Caution:** You must replace Revision A and Revision B Hard Disk 20SC drives like-for-like. To make sure the new drive matches the drive you are replacing, check its circuit board against the installed, defective drive. For Revision A drives, the component side of the board is up; for Revision B drives, the solder side is up.

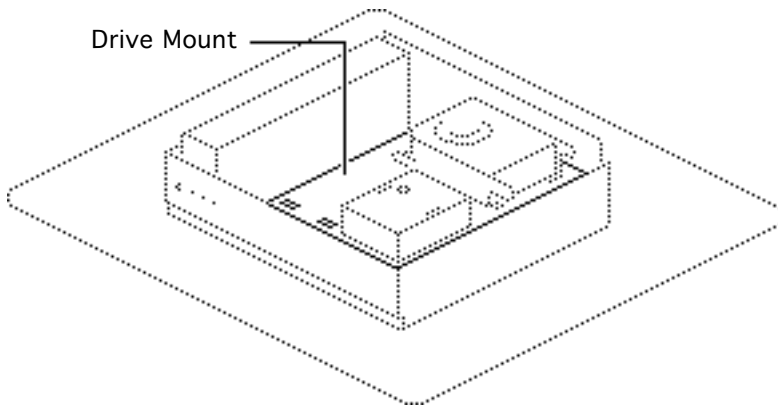


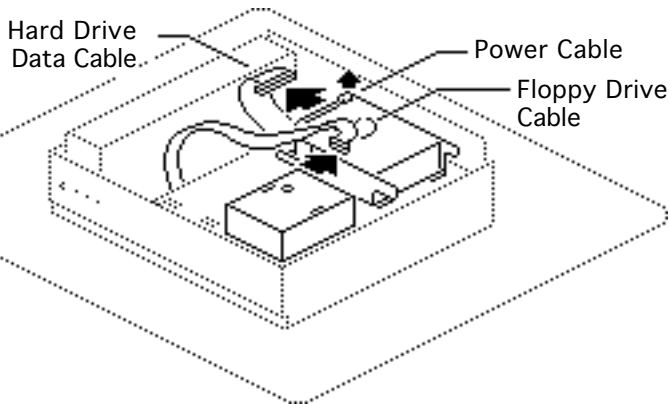


## Drive Mount

Before you begin, remove the cover.

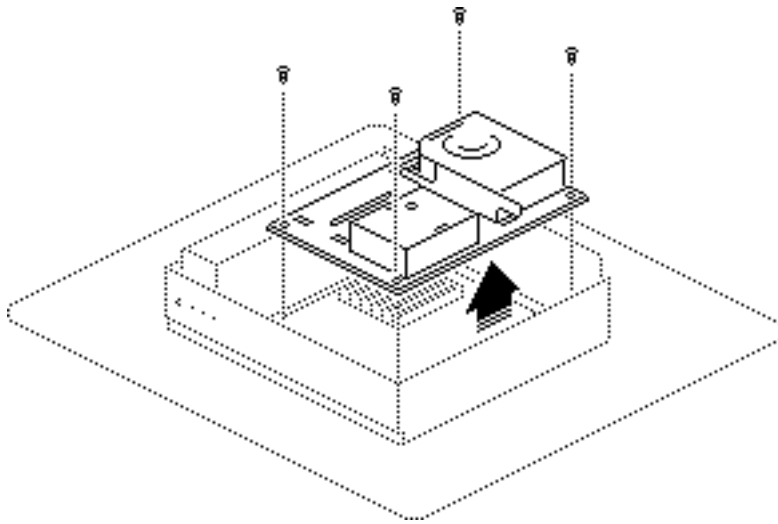
**Caution:** Review the ESD precautions in Bulletins/Safety.





- 1 Disconnect the floppy drive cables from floppy drives 1 and 2, if installed.
- 2 Disconnect the power cable and hard drive data cable from the hard drive, if installed.





- 3 Remove the four screws that hold the drive mount in place.
- 4 Remove the drive mount.



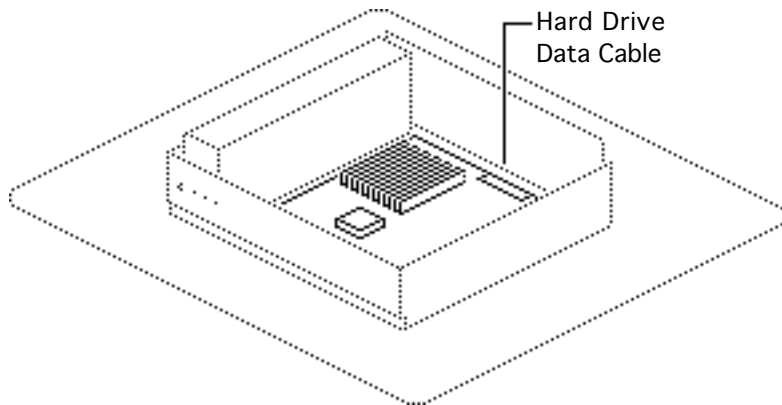


## Hard Drive Data Cable

Before you begin, remove the following:

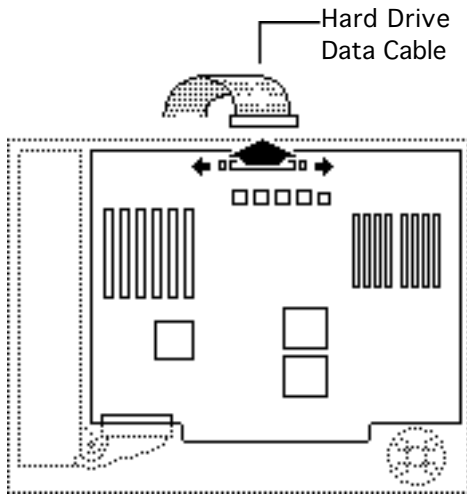
- Cover
- Drive mount

**Caution:** Review the ESD precautions in Bulletins/Safety.





Press outward on the two ejector tabs on the hard drive data cable connector (on the logic board) and disconnect the cable.





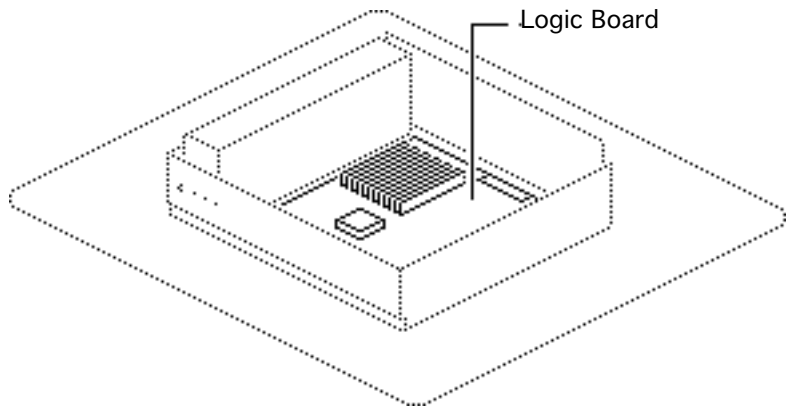


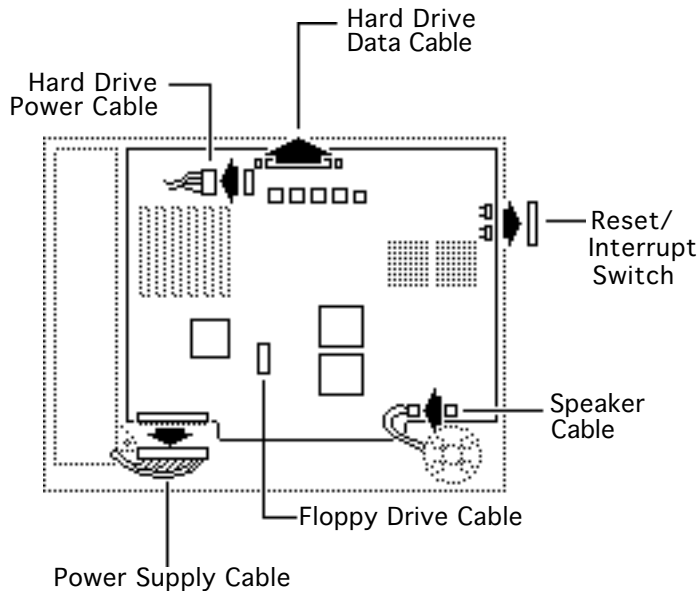
## Logic Board

Before you begin, remove the following:

- Cover
- Drive mount

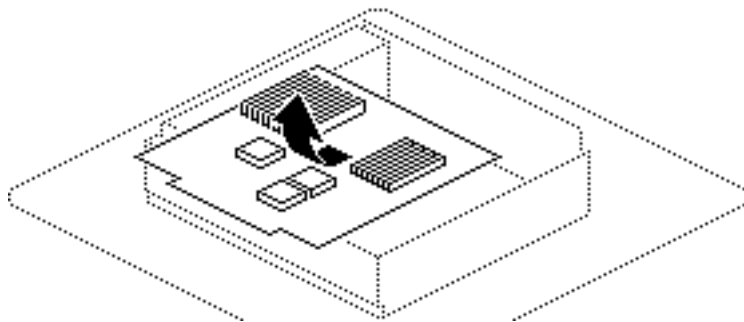
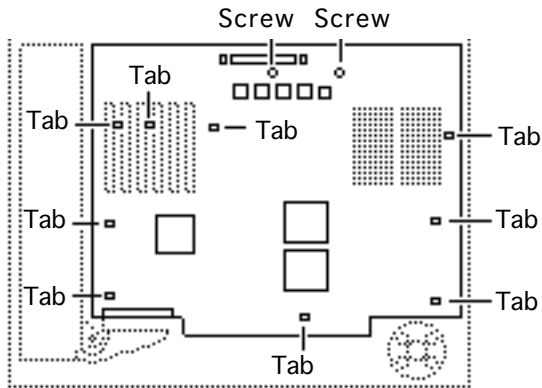
**Caution:** Review the ESD precautions in Bulletins/Safety.





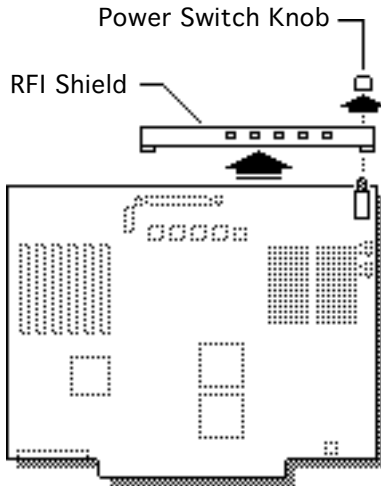
- 1 Disconnect the following cable connectors from the logic board:
  - Floppy drive cables
  - Hard drive data cable
  - Hard drive power cable
  - Speaker cable
  - Power supply cable
- 2 Remove the reset/interrupt switch, if installed.





- 3 Remove the two screws that hold the logic board in place.
- 4 Starting at the front of the logic board, gently lift the board as you push in each of the nine tabs, one at a time.
- 5 Slide the logic board toward the front of the case and lift the board from the case.





- 6 Remove the power switch knob and the RFI shield from the rear of the logic board.

**Replacement Note:** Remove the SIMMs from the defective logic board and install them on the replacement logic board.

**Replacement Note:** You may have to install a SCSI filter and/or terminator when replacing the logic board. Refer to “SCSI Termination” in Additional Procedures.





## Upgrades

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Macintosh II/IIx/IIfx





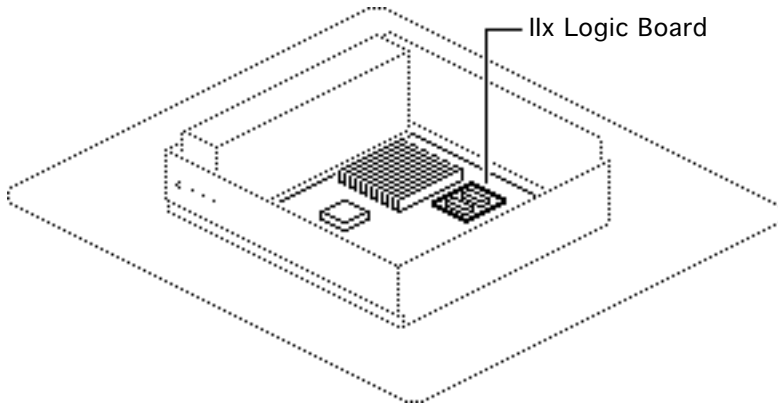
## Mac IIx Logic Board Upgrade

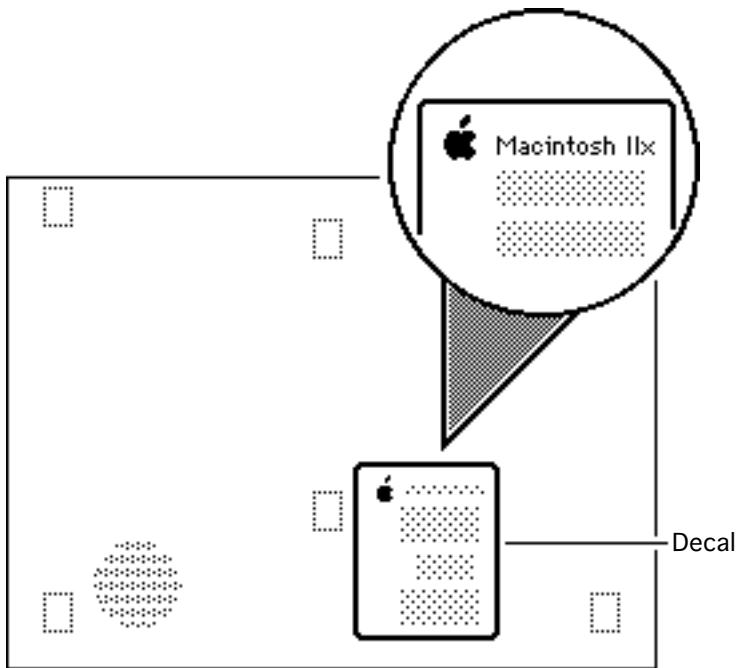
Before you begin, remove the following:

- Cover
- Drive mount
- Logic board

**Caution:** Review the ESD precautions in Bulletins/Safety.

**Note:** To upgrade the customer's logic board, replace the Macintosh II logic board with the new Macintosh IIx logic board.





(See “Logic Board” in the Take Apart chapter.) Return the old logic board to Apple.

Install the Macintosh IIx identification decal on the bottom cover.





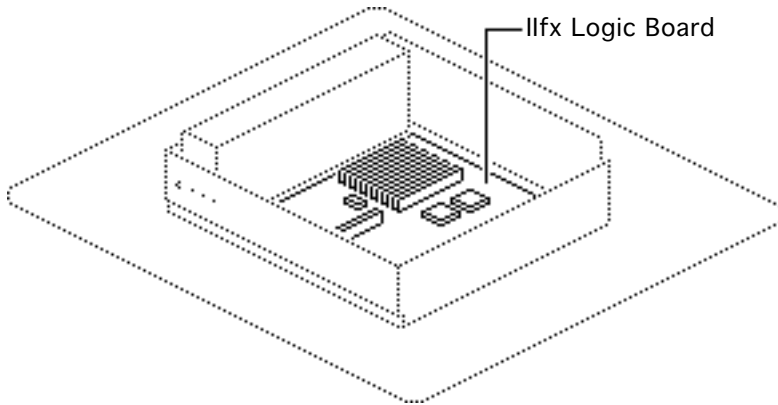
## Mac IIx Logic Board Upgrade

Before you begin, remove the following:

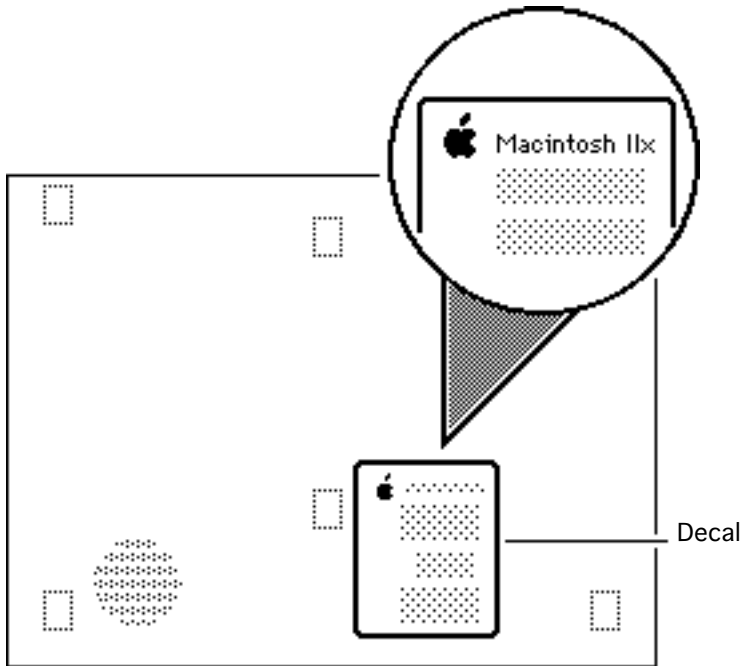
- Cover
- Drive mount
- Logic board

**Caution:** Review the ESD precautions in Bulletins/Safety.

**Note:** To upgrade the customer's logic board, replace the Macintosh II or Macintosh IIx logic board with the new Macintosh IIx







logic board. (See “Logic Board” in the Take Apart chapter.) Return the old logic board to Apple.

**Note:** If an internal hard drive is installed, remove the hard drive power cable and replace it with the one in the upgrade kit.

Install the Macintosh IIx identification decal on the bottom cover.



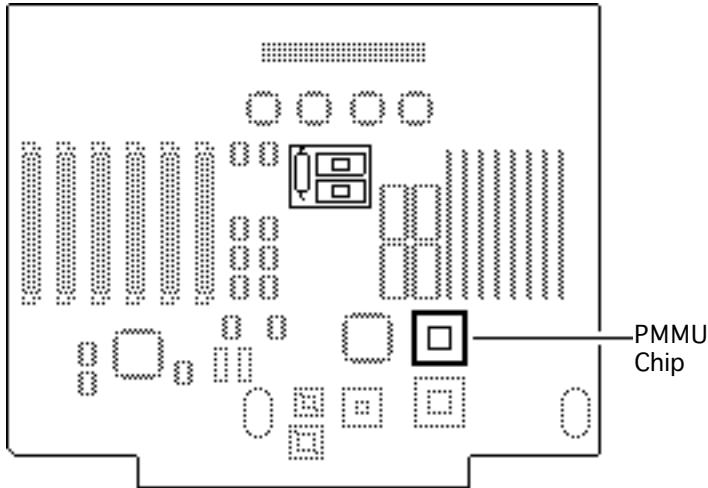


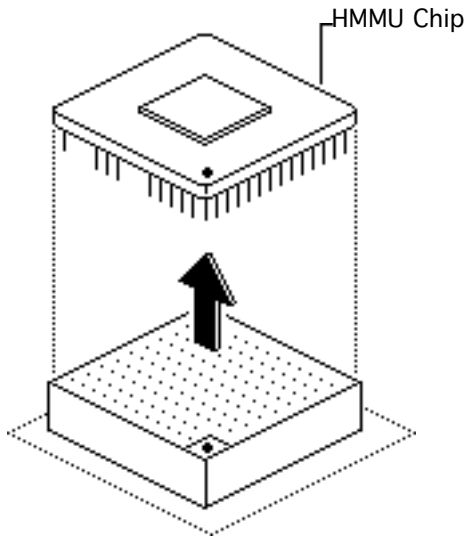
## PMMU Upgrade for Macintosh II

Before you begin, remove the following:

- Cover
- Drive mount

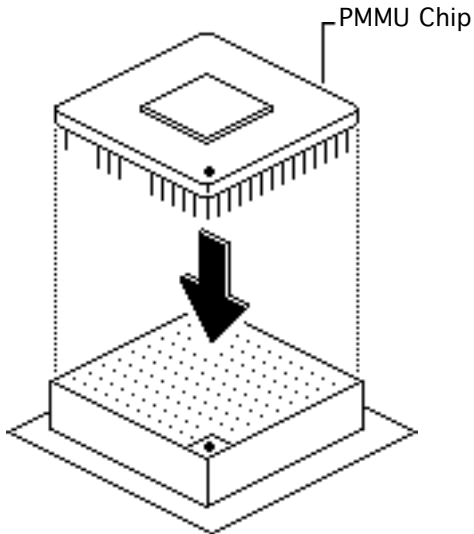
**Caution:** Review the ESD precautions in Bulletins/ Safety.





- 1 Using a small flat-blade screwdriver, gently pry up the sides of the HMMU and remove it from the socket.





- 2 **Caution:** Before pressing the new PMMU into the socket, verify that you positioned the PMMU correctly.

Position the PMMU so that the dot on the chip top aligns with the dot on the chip base.

- 3 Align the pins in the socket and gently press the PMMU into the socket.





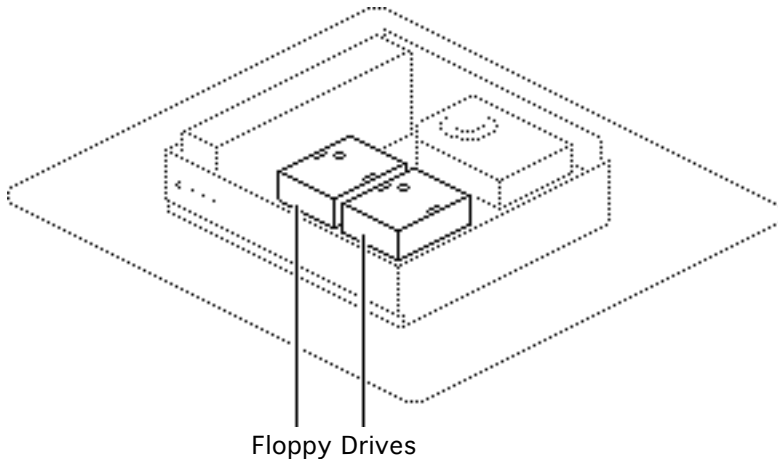
## 1.4 MB Floppy Drive Upgrade for Macintosh II

Before you begin, remove the following:

- Cover
- Drive mount

**Caution:** Review the ESD precautions in Bulletins/ Safety.

**Note:** The 1.4 MB Floppy Drive Upgrade Kit is no longer available. To upgrade a floppy drive to the Apple

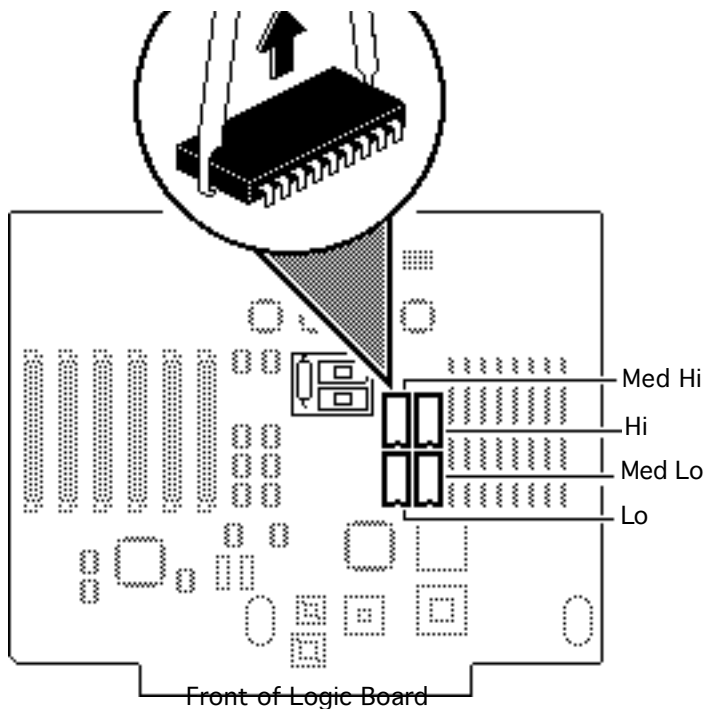




SuperDrive, upgrade the Macintosh II logic board to a Macintosh IIx or IIfx logic board.

**Important:** Use the 1.4 MB floppy drive with system software version 6.0.2 or later. Otherwise the Macintosh II mistakes the high-density drive for an 800K mechanism.

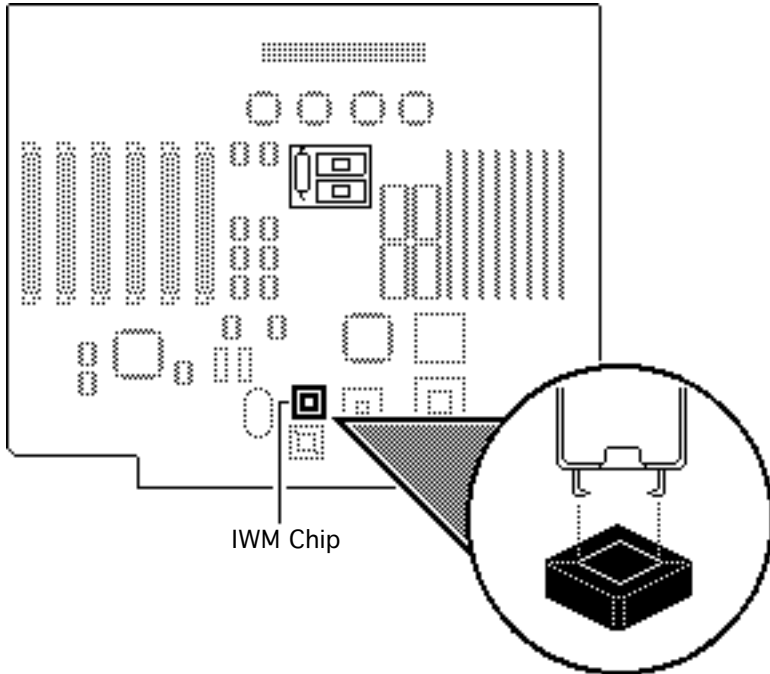




- 1 Using an IC extractor, remove the four ROM chips from the logic board.
- 2 Install the four new ROM chips on the logic board as follows:
  - HI (342-0639) at C13
  - MED HI (342-0640) at C12
  - MED LO (342-0641) at E13
  - LO (342-0642) at E12

**Note:** The notch at one end of each ROM chip



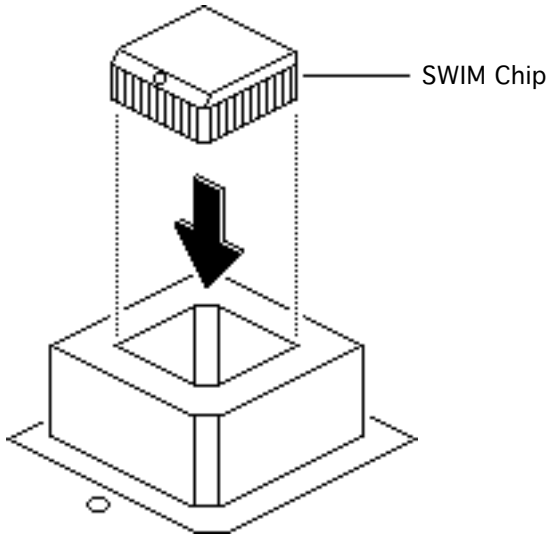


must face the front of the logic board.

- 3 Using an IC extractor, remove the IWM chip from the logic board.







- 4 **Caution:** Before pressing the new SWIM chip into the socket, verify that the chip is in the correct position.

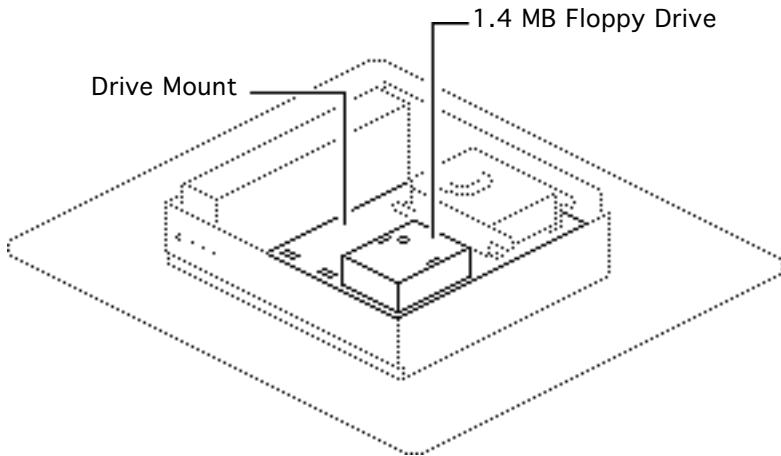
Position the SWIM chip so that the beveled edge with the white dot aligns with the dot on the logic board.

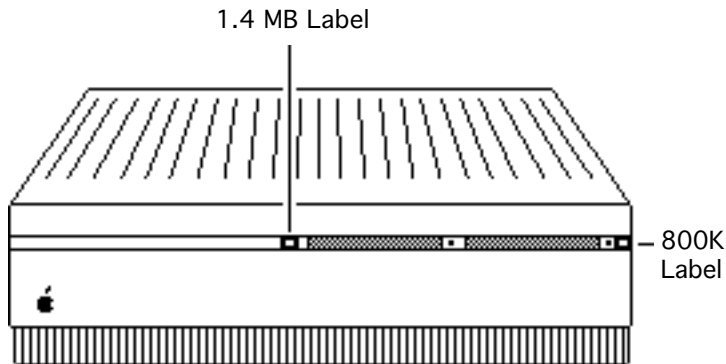
- 5 Align the pins in the socket and gently press the SWIM chip into the socket.





- 6 Install the 1.4 MB floppy drive onto the drive mount as drive 1 or drive 2.





- 7 Place 1.4 MB drive or 800K drive labels on the cover.
- 8 If necessary, install system software (6.0.2 or later) and run diagnostics.





## Additional Procedures

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Macintosh II/IIx/IIfx





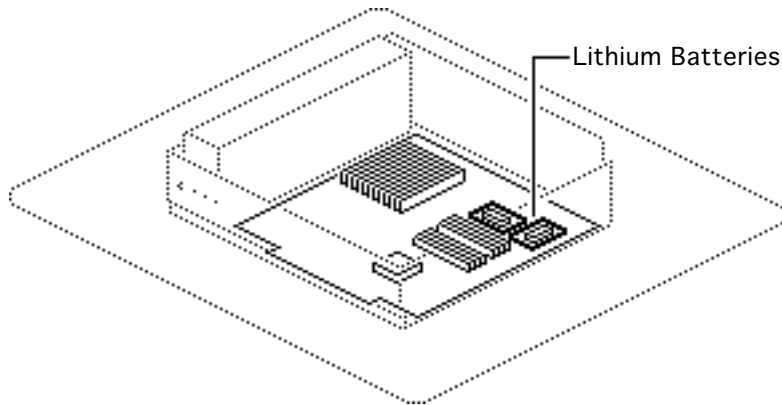
## Battery Verification

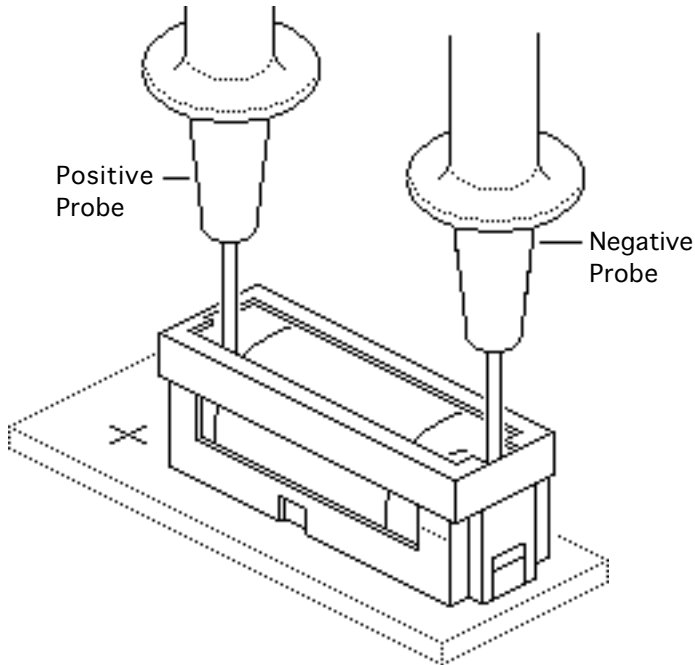
Before you begin, remove the following:

- Cover
- Drive mount

**⚠ Warning:** If handled or discarded improperly, the lithium batteries in the computer could explode. Review battery handling and disposal instructions in Bulletins/Safety.

**Caution:** Review the ESD precautions in Bulletins/





Safety.

Set the voltmeter to the 10 volts DC scale.

- 1 Hold the positive probe of the voltmeter to the positive end of the battery (marked “+” on the logic board) and the negative probe to the negative end of the battery.
- 2 If the battery voltage is below 3.2 volts, replace the battery. Refer to “Battery Replacement” in this chapter.



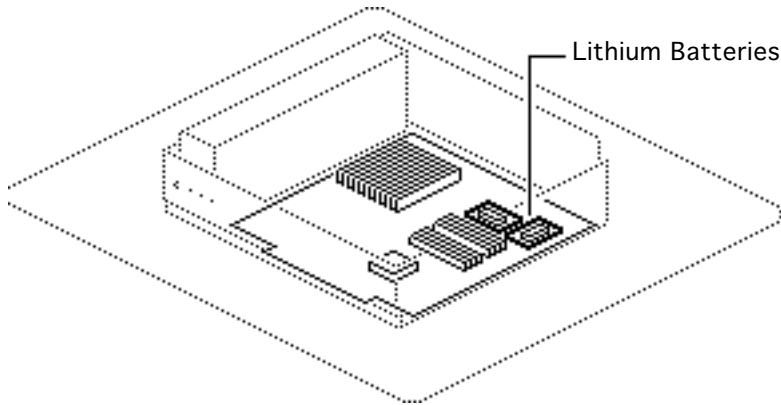


## Battery Replacement

Before you begin, remove the following:

- Cover
- Drive mount

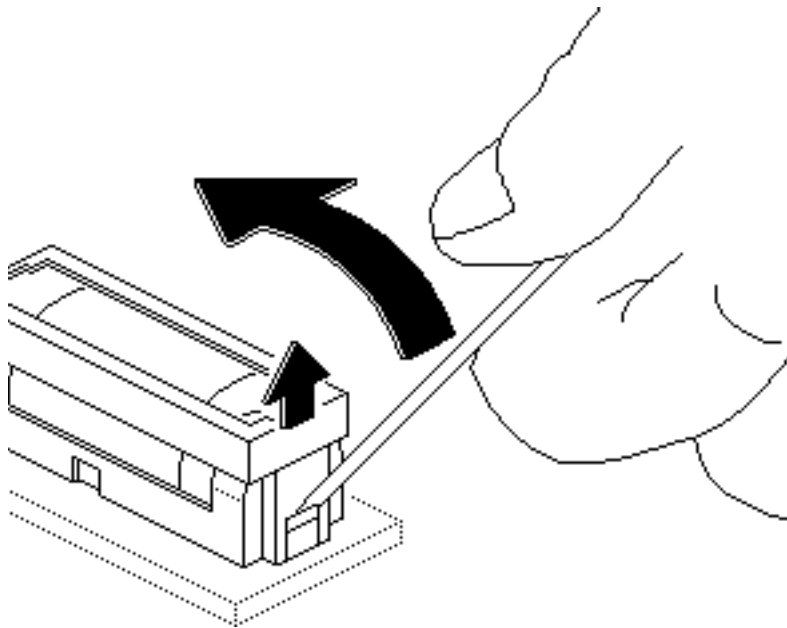
**⚠ Warning:** If handled or discarded improperly, the lithium batteries in the computer could explode. Review battery handling and disposal instructions in Bulletins/Safety.



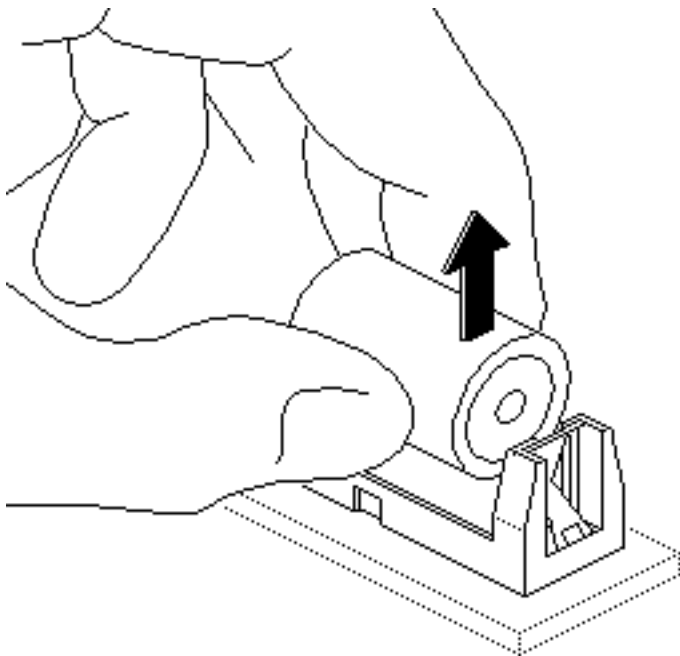


**Caution:** Review the ESD precautions in Bulletins/ Safety.

- 1 Using a small flat-blade screwdriver, gently pry the latch away from the holder and lift off the cover.







- 2 Grasp the battery and remove it from the holder.
- 3 Return the battery to Apple for proper disposal. For battery packaging and labeling instructions, refer to the safety information in Bulletins/Safety.



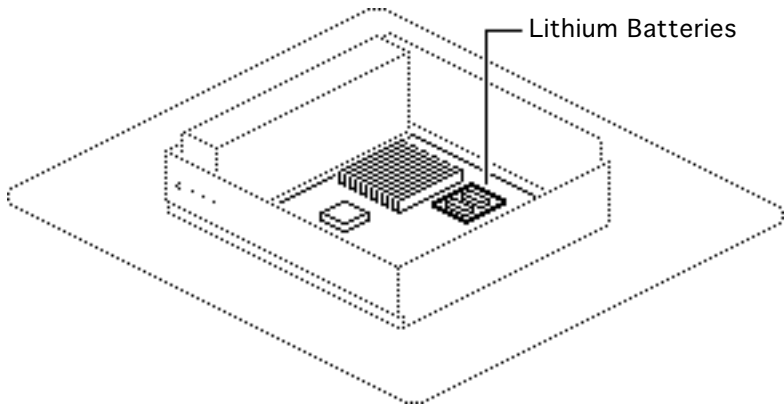


## Battery Holder Board

Before you begin, remove the following:

- Cover
- Drive mount
- Logic board

**Note:** This procedure explains how to install a battery holder board in a Macintosh II or IIx. Before you change batteries in a Macintosh II or IIx without a battery holder, install the holder.

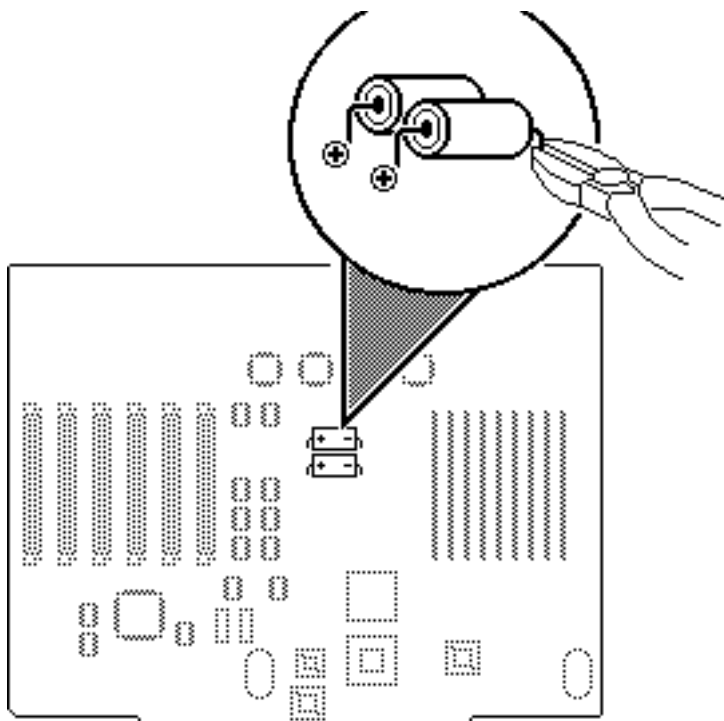




**⚠ Warning:** If handled or discarded improperly, the lithium batteries in the computer could explode. Review battery handling and disposal instructions in Bulletins/Safety.

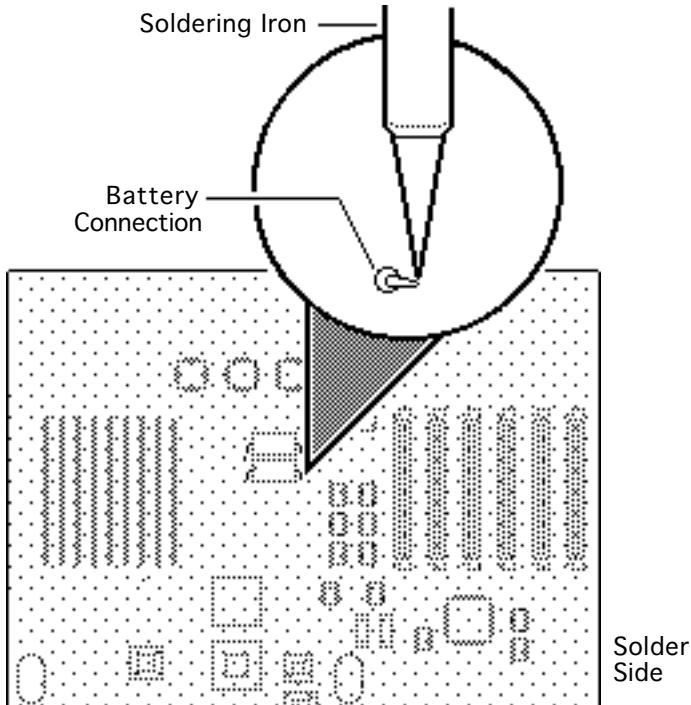
**Caution:** Review the ESD precautions in Bulletins/Safety.





- 1 If the battery is soldered to the logic board, use wire clippers to cut the battery leads. Leave the lead wires long enough so you can pull them out of the logic board when you melt the solder holding them in place.
- 2 Return the battery to Apple for proper disposal. For battery packaging and labeling instructions, refer to Bulletins/Safety.





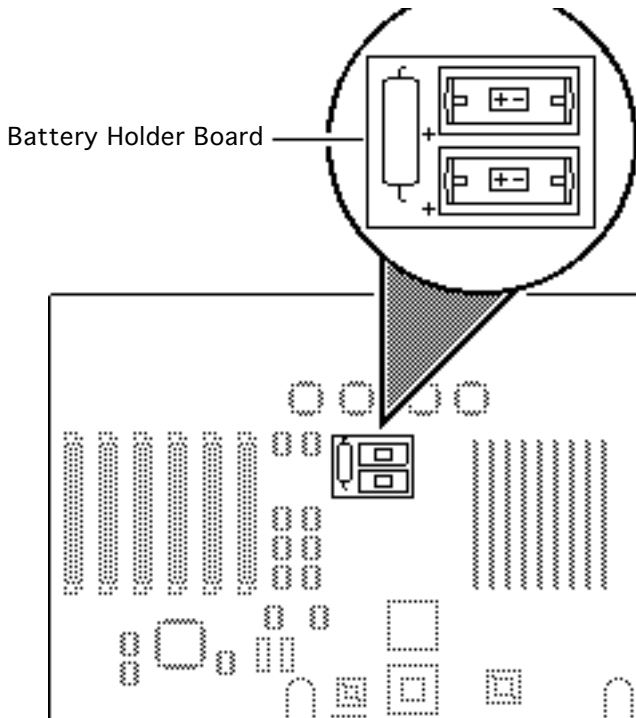
- 3 Caution:** Use a 50-watt (or less) soldering iron. Excessive heat may damage the logic board.

Desolder the four battery connections from the underside of the logic board.

- 4 Caution:** Do not force the connections free or you may remove the copper traces from the board.

Remove the wire from each hole and clear the hole of solder.



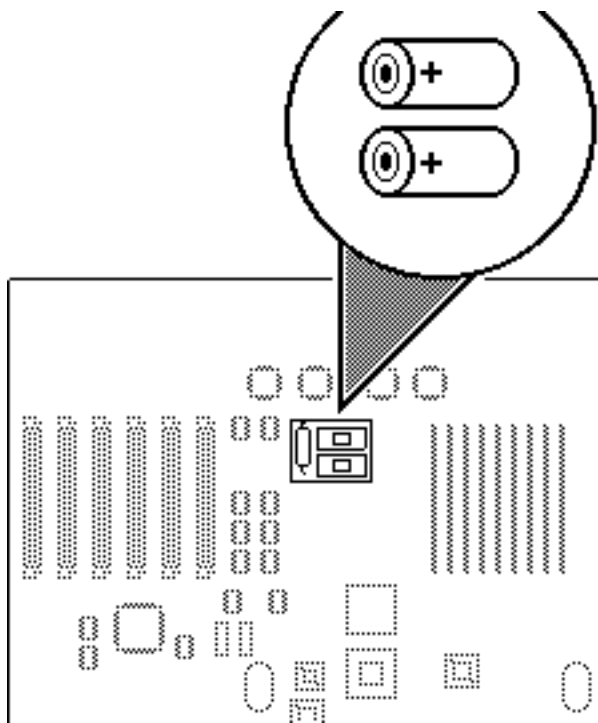


- 5 **Caution:** Be sure to insert the positive side of the battery holder board into the two positive-marked holes on the logic board. A wrong orientation may damage the logic board.

Insert the battery holder board. Make sure the battery holder board is flush with the logic board.

- 6 Solder the battery holder board in place.





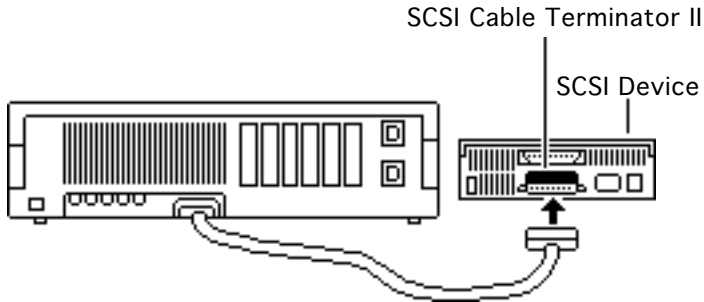
- 7 Install the batteries and the battery covers on the battery holder board.





## Macintosh IIx SCSI Termination

No preliminary steps are required before you begin this procedure.

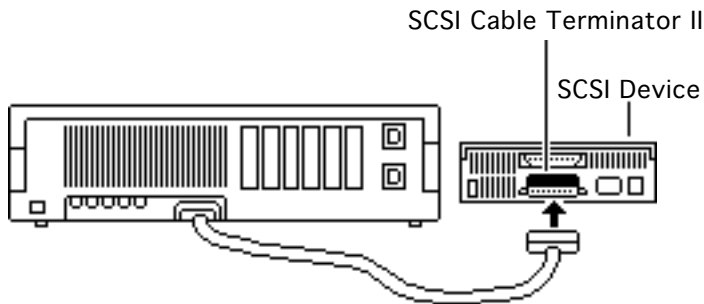






## External SCSI Devices

The SCSI Cable Terminator II provides proper termination for external SCSI devices attached to a Macintosh IIx computer. If an external device has built-in termination, you must disable the built-in terminator and install the SCSI Cable Terminator II.





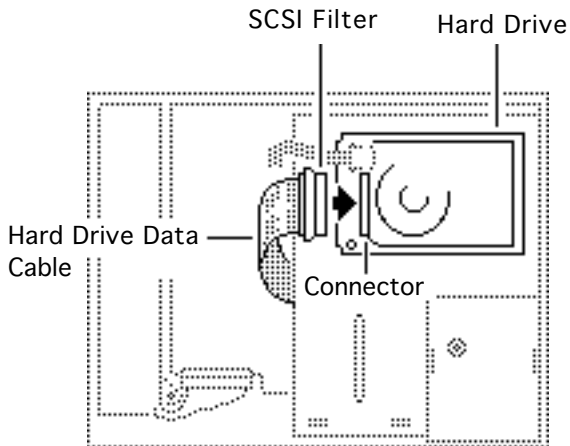
**Caution:** Never install more than one SCSI Cable Terminator II on a Macintosh IIx SCSI daisy chain or you could damage the equipment.





## Internal Hard Drives

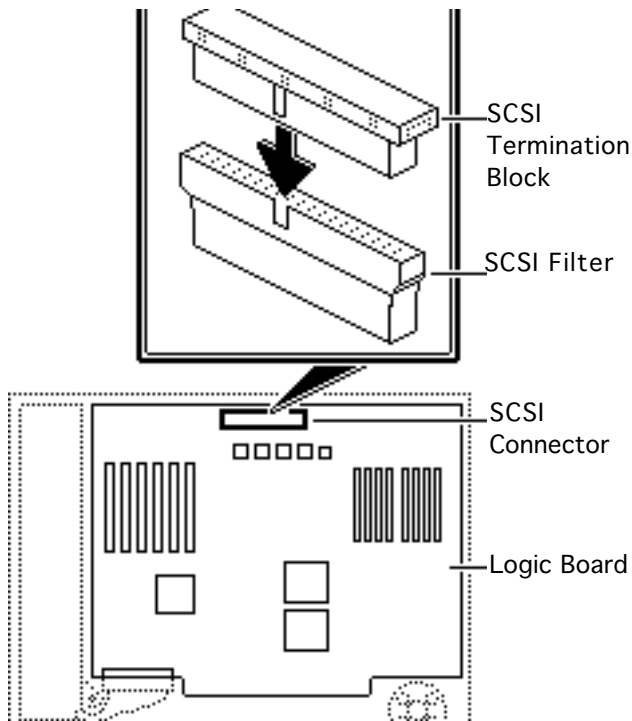
The internal SCSI filter provides proper termination capacitance for third-party drives and Apple internal hard drives that shipped before March 19, 1990. Connect the SCSI filter between the hard drive data cable and the connector on the hard drive.





**Caution:** When you install an internal hard drive in a system that shipped without a drive, you must connect the SCSI filter to the drive. Connecting the filter directly to the logic board will cause SCSI failures.





## Systems without an Internal Hard Drive

The SCSI termination block and internal SCSI filter provide proper termination for systems without an internal hard drive. All Macintosh IIx computers that shipped without internal hard drives have the termination block and SCSI filter attached to the logic board SCSI connector. After you install an internal hard drive, remove the block and connect the filter to the SCSI connector on the drive.





Exploded View

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Macintosh II/IIx/IIfx





# Exploded View

