



PowerBook 165c/180c

PowerBook 165c, PowerBook 180c





Basics

PowerBook 165c, 180c



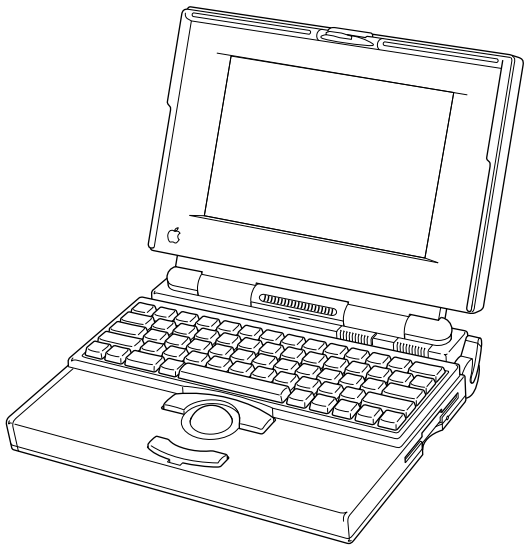


Figure: PowerBook 165C, 180C

Overview

This manual includes complete repair procedures for the PowerBook 165C and PowerBook 180C, shown at left.





Display Compatibility Matrix

	FSTN PowerBook 165c 661-0752	Active Matrix PowerBook 180c 661-0686
Inverter	922-0374	922-0378
Display Cable	922-0373	922-0380
Inverter Cable	922-0566	922-0412

Important: The PowerBook 165c/180c family includes two displays—an active matrix and an FSTN display. Each of these displays requires a compatible inverter and display cable; the inverters, display cables, and displays are not interchangeable. Before ordering one of these parts, refer to the display matrix shown above.





Specifications

PowerBook 165c, 180c





Introduction

Specifications information for this product can be found in this chapter and also in the Spec Database, which you can access in one of three ways:

- Launch it directly by double-clicking the Apple Spec Database runtime alias at the top level of the Main Service Source CD.
- Select “Apple Spec Database” from the Service Source drop-down main menu.
- Click the Acrobat toolbar icon for the database, which is near the right end of the toolbar with the letters “SP.”





Configurations

Standard 165c

4 MB PSRAM, FSTN color display, 80/120 MB hard drive, 1.4 MB Apple SuperDrive, NiCad battery, AC adapter, and microphone

Standard 180c

4 MB PSRAM, 8.4 in (226 mm) diagonal backlit color active-matrix LCD display, 80 or 160 MB hard drive, 1.4 MB Apple SuperDrive, NiCad battery, AC adapter, and microphone

Options

Internal PowerBook Express Modem (14,400 bps)

Internal PowerBook Fax/Data Modem (2400 bps)

4 MB memory expansion kit

PowerBook battery recharger

HDI-30 SCSI system cable

HDI-30 SCSI disk adapter





Processor

CPU	Motorola 68030 microprocessor 33 MHz
Coprocessor	Motorola 68882 floating-point math coprocessor 33 MHz
Addressing	32-bit internal registers 32-bit address bus 32-bit data bus





Memory

RAM	4 MB pseudostatic RAM (PSRAM) Expandable to 8 MB by adding 4 MB expansion card Expandable to 14 MB with third-party PSRAM expansion cards Requires 85 ns or faster RAM chips
ROM	1 MB
PRAM	256 bytes of parameter memory





VRAM 512K of video RAM supports internal display and external monitor

Clock/Calendar CMOS custom chip with long-life lithium battery





Disk Storage

Floppy Drive

19 mm high, internal, 1.4 MB Apple SuperDrive

Hard Drive

2.5 in. SCSI hard drives (many capacities)





I/O Interfaces

Apple Desktop Bus

ADB port (maximum of three ADB devices is recommended)
200 mA maximum current draw for all ADB devices

Serial

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

SCSI

HDI-30 SCSI port with 1.5 MB/sec. transfer rate
Connect SCSI device to computer with HDI-30 SCSI system cable.

Sound

Monaural sound-in port; adapters required to input sound from audio equipment with line level outputs (line level signals must be attenuated 500:1)
Stereo sound-out jack for headphones or external audio amplifier





Video	Video-out port; 8 bit, 256 color video support Micro DB-15 connector Supports most Macintosh monitors, VGA and SVGA monitors
Power Adapter	Power adapter port
Modem	Slot for optional internal modem
Security	Slot for third-party security equipment





I/O Devices

Keyboard

Built-in keyboard with standard Macintosh layout

63 keys domestic; 64 keys ISO

3.0 mm travel; 18 mm vertical pitch, 18.63 mm horizontal pitch

Two-level tilt adjustment

Trackball

30 mm diameter, dual button

Apple Desktop Bus (ADB) interface

Microphone

Electret, omnidirectional

Output voltage of 4 mV, peak to peak





Sound and Video

Sound Generator

Apple sound chip provides 4-voice, 8-bit sound
8-bit sound input, sampled at 11 or 22 kHz

PowerBook 165c Video Display

9 in. (230 mm) diagonal screen
Flat-panel, color, film-compensated supertwist nematic (FSTN)
liquid crystal display
CCFL on-demand backlight
640 lines by 400 pixels; 8 bit; 256 colors

PowerBook 180c Video Display

8.4 in. (215 mm) diagonal screen
Flat-panel, color, active-matrix, liquid crystal display
CCFL on-demand backlight
640 lines by 480 pixels; 8 bit; 256 colors





Electrical

Main Battery

Rechargeable nickel cadmium (NiCad) battery
Provides 1.5–2 hours of usage before recharging

PRAM Battery

3 V, 30 mAh rechargeable lithium battery

Power Adapter

110–240 VAC line voltage
24 W, 50–60 Hz
US, United Kingdom, Australian, and European versions





Physical

PowerBook 165c

Height: 2.29 in. (58 mm)

Width: 11.26 in. (286 mm)

Depth: 9.29 in. (236 mm)

Weight: 7.0 lb. (3.18 kg) with battery

PowerBook 180c

Height: 2.34 in. (59 mm)

Width: 11.25 in. (286 mm)

Depth: 9.3 in. (236 mm)

Weight: 7.1 lb. (3.2 kg) with battery





Environmental

Operating Temperature	50-104° F (10-40° C)
Storage Temperature	-13 to 140° F (-25 to 60° C)
Relative Humidity	20-80% noncondensing
Shipping Altitude	0-15,000 ft. (0-4722 m)
Operational Altitude	0-10,000 ft. (0-3048 m)





Other

Fax/Data Modem

Internal 2400-baud modem with fax send at 9600 baud (includes fax send software)

300/1200/2400 bps transmission rates

Serial binary and asynchronous protocols

Error correction and data compression: MNP 4, 5 and V.42, V.42bis



**Express Modem**

Internal 14,400-baud modem with fax send and receive capability at 9600 baud

300 to 14,400 bps data transmission rates

2400/4800/7200/9600 bps fax transmission rates

Full duplex operation; asynchronous or framed modes

Error correction: V.42 compliance (MNP 2-4)

Data compression: V.42 bis (4 to 1 compression) and MNP-5 (2 to 1 compression)

Requires 300K of system RAM

SCSI Disk Adapter

Enables connection between PowerBook computer and desktop Macintosh (PowerBook appears as a hard drive on the desktop)





Troubleshooting

PowerBook 165c, 180c





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.





Power Manager Reset

Reset the power manager if

- The battery and power adapter are proven good, but the computer will not power on.
- The computer will not reset after a system crash.

To reset the power manager in a PowerBook 165c/180c,

- Remove the AC adapter and the battery.
- Let the unit sit without power hooked up for 3–5 minutes.
- Reinstall the battery and, if necessary, reconnect the AC adapter.
- Turn on the computer.

If this does not reset the power manager,

- Remove the AC adapter and the battery.





- Let the unit sit without power hooked up for 3–5 minutes.
- Using two paper clips, simultaneously hold down the reset and interrupt buttons for 5–10 seconds.
- Reinstall the battery and, if necessary, reconnect the AC adapter.
- Turn on the computer.





Symptom Charts

Startup

RAM failure occurs
(eight-tone error
chord sequence
sounds after startup
chord)

- 1 Reseat PSRAM expansion card and check connection.
- 2 Replace PSRAM expansion card.
- 3 Replace daughterboard.
- 4 Replace motherboard.

Hardware failure
occurs (four-tone
error chord sequence
sounds after startup
chord)

- 1 Disconnect hard drive data cable and restart computer. If startup sequence is normal, reconnect cable and retest.
- 2 Replace hard drive.
- 3 Disconnect floppy drive cable and restart computer. If startup sequence is normal, reconnect cable and retest.
- 4 Replace floppy drive.
- 5 Replace motherboard.





Startup (Continued)

Screen displays
checkerboard pattern;
no startup chime

- 1 Reseat RAM expansion card.
- 2 Replace RAM expansion card.
- 3 Replace daughterboard.
- 4 Reseat display cable.





Power

Screen is blank;
computer doesn't
respond

- 1 Restart computer.
- 2 Connect power adapter and restart computer in 3–4 minutes.
- 3 Try known-good, charged main battery.
- 4 Check all interconnect board, daughterboard, and motherboard connections.
- 5 Reset the power manager.
- 6 Replace keyboard.
- 7 Replace interconnect board.
- 8 Replace daughterboard.
- 9 Replace motherboard.
- 10 PowerBook165c: Replace display.
- 11 PowerBook180c: Replace display (CPRC/international repairers only).





Power (Continued)

After you remove main battery, some Control Panel settings are different

- 1 Check cables.
- 2 Replace interconnect board.
- 3 Replace daughterboard.
- 4 Replace motherboard.

Power adapter is plugged in, but battery DA does not indicate charger is connected

- 1 This is normal for fully charged battery.
- 2 Check battery charger connection.
- 3 Try known-good, charged main battery.
- 4 Try known-good power adapter.
- 5 Check battery thermistor cable connection.
- 6 Replace motherboard.





Power (Continued)

Low-power warning appears

- 1 Recharge battery or attach power adapter.
- 2 Verify that peripherals are low-power.
- 3 PowerBook 165c: Remove external devices or connect power adapter.
- 4 PowerBook 180c: Remove external devices.
- 5 Try known-good, charged main battery.
- 6 Try known-good power adapter.
- 7 Replace motherboard.

Computer runs when plugged into wall outlet but not on battery power; battery voltage is within tolerance

- 1 Reseat battery to make sure it is mating with contacts on motherboard.
- 2 If motherboard includes removable fuse, replace fuse.
- 3 Replace motherboard.
- 4 Return computer to Apple.





Power

Computer won't start with battery removed or with depleted battery

- 1 Make sure AC adapter is 24-watt.
- 2 Make sure battery is charged.
- 3 Replace AC adapter.

The 180c powers on, then powers off when screen lights up

- 1 Make sure AC adapter is 24-watt. ("24W" should be imprinted on the adapter. Or, check the model number, which should be M5652). If it's not a 24-watt adapter, replace it





Video

Row or partial row of pixels never comes on or is always on

PowerBook 165c:

- 1 Check cables.
- 2 Replace display cable.
- 3 Replace display.
- 4 Replace interconnect board.

PowerBook 180c:

- 5 Check cables.
- 6 Replace display cable.
- 7 Replace interconnect board.
- 8 Replace display (CPRC/international repairers only).





Video (Continued)

Thin white line is
always on at middle of
screen

PowerBook 165c:

Thin white line is normal.

PowerBook 180c:

Replace display (CPRC/international repairers only) or return
computer to Apple.





Video (Continued)

Display is very light
or totally white

- 1 PowerBook 165c: Adjust screen contrast.
- 2 Check display cable, converter, inverter, interconnect board, daughterboard, and motherboard connections.
- 3 Replace converter board.
- 4 PowerBook 180c: Replace inverter board.
- 5 Replace interconnect board.
- 6 Replace display cable.
- 7 PowerBook 165c: Replace display.
- 8 PowerBook 180c: Replace display (CPRC/international repairers only).





Video (Continued)

No display, but computer appears to operate correctly

- 1 PowerBook 165c: Adjust screen contrast and backlight intensity.
- 2 PowerBook 180c: Adjust backlight intensity.
- 3 Check display cable, converter, inverter, interconnect board, daughterboard, and motherboard connections.
- 4 Connect power adapter.
- 5 Replace converter board.
- 6 PowerBook 180c: Replace inverter board.
- 7 Replace interconnect board.
- 8 Replace converter-to-inverter cable.
- 9 Replace display cable.
- 10 PowerBook 165c: Replace display.
- 11 PowerBook 180c: Replace display (CPRC/international repairers only).
- 12 Replace daughterboard.
- 13 Replace motherboard.





Video (Continued)

Rainbow colors visible from extreme viewing angles

PowerBook 165c:

Such colors are normal for FSTN screens.

Screen brightness is not uniform

PowerBook 165c:

Irregularity in screen brightness is normal. Adjust contrast and brightness to diminish effect.

PowerBook 180c:

Replace display (CPRC/international repairers only).





Video (Continued)

Display stopped working or dimmed but is fine now

PowerBook 165c:

If temperature is in the approximate range of under 5 or over 40 degrees centigrade, this reaction is normal.





Video (Continued)

Backlight doesn't operate

- 1 Verify that cables are not pinched or severed.
- 2 Check display cable, converter, inverter, interconnect board, daughterboard, and motherboard connections.
- 3 Replace converter board.
- 4 PowerBook 180c: Replace inverter board.
- 5 Replace converter-to-inverter cable.
- 6 Replace interconnect board.
- 7 PowerBook 165c: Replace display.
- 8 Replace daughterboard.
- 9 Replace motherboard.
- 10 PowerBook 180c: Replace display (CPRC/international repairers only).





Video (Continued)

Screen goes blank

- 1 Press any key to wake computer from system sleep.
- 2 Check display cable connection.
- 3 Reseat daughterboard.
- 4 Replace daughterboard.





Video (Continued)

Pixel is always white
or always black

PowerBook 180c: In general, no display should be replaced because of subpixel irregularities. If the number of irregularities on a display appears excessive, contact Apple for more information.

Note: Each pixel on an active-matrix color display consists of three subpixels (red, green, and blue). In turn, each subpixel has a transistor that controls light transmission. A PowerBook 180c display, therefore, contains a total of 921,000 transistors (640 x 480 x 3). Due to technology constraints, subpixel transistor irregularities (red, green, blue, black, and white) are allowed in this display.

PowerBook 165c: replace display.





Floppy Drive

Audio and video present, but internal floppy drive does not operate

- 1 Try known-good floppy disk.
- 2 Check floppy drive cable connection.
- 3 Replace floppy drive cable.
- 4 Replace floppy drive.
- 5 Replace daughterboard.
- 6 Replace motherboard.

Disk ejects while booting; display shows Macintosh icon with blinking X

- 1 Try known-good system disk.
- 2 Verify that trackball or mouse button is not stuck.
- 3 Check floppy drive cable connection.
- 4 Replace floppy drive cable.
- 5 Replace floppy drive.
- 6 Replace motherboard.





Floppy Drive (Continued)

Disk does not eject

- 1 Switch off system and hold mouse button down while you switch system on.
- 2 Insert opened paper clip into hole beside drive.
- 3 Check floppy drive cable connection.
- 4 Replace floppy drive cable.
- 5 Replace floppy drive.
- 6 Replace daughterboard.
- 7 Replace motherboard.

Disk initialization fails

- 1 Try known-good floppy disk.
- 2 Install inverter shield (if absent).
- 3 Check floppy drive cable connection.
- 4 Replace floppy drive cable.
- 5 Replace floppy drive.





Floppy Drive (Continued)

Read/write/copy
error

- 1 Try known-good floppy disk.
- 2 Install inverter shield if absent.
- 3 Check floppy drive cable connection.
- 4 Replace floppy drive cable.
- 5 Replace floppy drive.





Hard Drive

Internal hard drive
does not operate

- 1 Disconnect external SCSI devices.
- 2 Check internal hard drive cable connection.
- 3 Use HD SC Setup to reinitialize drive.
- 4 Replace internal hard drive cable.
- 5 Replace internal hard drive.
- 6 Replace motherboard.





Peripheral

After you connect external SCSI device, computer does not boot

- 1 Switch on external SCSI device before starting computer.
- 2 Check cable connections.
- 3 Verify that standard Apple terminator terminates SCSI chain at beginning and end.
- 4 Verify that SCSI select switch setting on external device is unique.
- 5 Verify operation of internal hard drive.
- 6 Try known-good external SCSI device.
- 7 Replace motherboard.





Peripheral (Continued)

Cursor does not move when you are using trackball

- 1 Restart computer.
- 2 Check cables.
- 3 Check interconnect board, daughterboard, and motherboard connections.
- 4 Try low-power mouse. If cursor moves, replace trackball or keyboard.
- 5 Replace interconnect board.
- 6 Replace daughterboard.
- 7 Replace motherboard.

Cursor intermittently does not move or moves erratically

- 1 Restart computer.
- 2 Check cables.
- 3 Replace trackball.
- 4 Replace keyboard.
- 5 Replace interconnect board.
- 6 Replace motherboard.





Peripheral (Continued)

Cursor moves, but clicking trackball button has no effect

- 1 Restart computer.
- 2 Check interconnect board, daughterboard, and motherboard connections.
- 3 Replace trackball.
- 4 Replace keyboard.
- 5 Replace interconnect board.
- 6 Replace daughterboard.
- 7 Replace motherboard.

Cursor does not move when you are using mouse

- 1 Check mouse connection to ADB port.
- 2 Restart computer.
- 3 Clean mouse ball and inside mouse.
- 4 Replace mouse.
- 5 Replace motherboard.





Peripheral (Continued)

No response to any key on keyboard

- 1 Reset power manager. (Unplug power adapter, shut down computer, wait, and then restart computer.)
- 2 Check connections of keyboard to interconnect board, and interconnect board to daughterboard.
- 3 Replace keyboard.
- 4 Replace interconnect board.
- 5 Replace daughterboard.

Known-good direct-connect printer does not print

- 1 Verify that System is 7.1 or later.
- 2 Verify that Chooser and Control Panel settings are correct.
- 3 Check cables.
- 4 Replace printer interface cable.
- 5 Try known-good printer.
- 6 Replace daughterboard.
- 7 Replace motherboard.





Peripheral (Continued)

Known-good network printer does not print

- 1 Verify that System is 7.1 or later.
- 2 Verify that Chooser and Control Panel settings are correct.
- 3 Check cables.
- 4 Replace printer interface cable.
- 5 Try known-good printer. If printer works, troubleshoot network.
- 6 Replace daughterboard.
- 7 Replace motherboard.

Device connected to external modem port doesn't work

- 1 Verify that External Modem is selected in CDEV.
- 2 Verify that System is 7.1 or later.
- 3 Check cables.
- 4 Test device with known-good computer.
- 5 Replace daughterboard.
- 6 Replace motherboard.





Peripheral (Continued)

I/O devices are unrecognized or garbage is transmitted or received

- 1 Verify that System is 7.1 or later.
- 2 Check cables.
- 3 Verify that SCSI device has standard Apple terminator.
- 4 Verify that SCSI select switch setting on external device is unique.
- 5 Test device with known-good computer.
- 6 Replace daughterboard.
- 7 Replace motherboard.





Internal Modem

Internal modem options do not appear in CDEV

- 1 Remove and reseal modem card.
- 2 Verify that System is 7.1 or later.
- 3 Replace modem card.
- 4 Replace motherboard.

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 Check phone cord connection and operation.
- 3 Remove and reseal modem card.
- 4 Verify that System is 7.1 or later.
- 5 Replace modem card.





Internal Modem (Continued)

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 Check phone cord connection and operation.
- 3 Remove and reseal modem card.
- 4 Verify that System is 7.1 or later.
- 5 Replace modem card.
- 6 Replace daughterboard.
- 7 Replace motherboard.

Modem interferes with system sound

- 1 Remove and reseal modem card.
- 2 Replace modem board.
- 3 Replace interconnect card.
- 4 Replace motherboard.





Internal Modem (Continued)

Modem does not respond to incoming call

- 1 If computer is in sleep mode, verify that Wake On Ring option in CDEV is selected.
- 2 Check phone cord connection and operation.
- 3 Replace modem card.
- 4 Replace motherboard.

Modem has no sound output

- 1 Verify that Control Panel volume setting is above 0.
- 2 Replace modem card.
- 3 Replace interconnect card.
- 4 Replace motherboard.

Modem connects but does not communicate with remote modem

- 1 Verify that remote modem needs error correction (error correction is internal modem default).
- 2 Type AT &Q0 to disable error correction.





Miscellaneous

Screen goes blank and computer shuts down every few minutes

Adjust sleep delays in Control Panel or connect power adapter.

Application seems to run slower after few seconds

- 1 Disable System Rest. (See owner's manual.)
- 2 Connect power adapter.

Hard drive is slow to respond, or screen goes blank too often

Adjust sleep delays in Control Panel or connect power adapter.





Miscellaneous (Continued)

No sound from speaker

- 1 Verify that volume setting in Control Panel is above 0.
- 2 Verify that no external speaker is plugged in.
- 3 Check connections of speaker to interconnect board, interconnect board to daughterboard, and daughterboard to motherboard.
- 4 Replace interconnect board.
- 5 Replace daughterboard.
- 6 Replace motherboard.

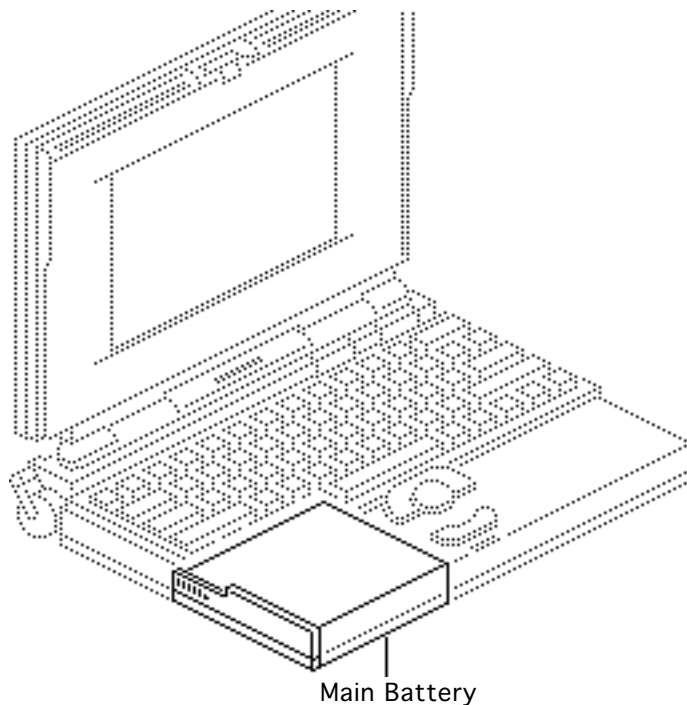




Take Apart

PowerBook 165c, 180c





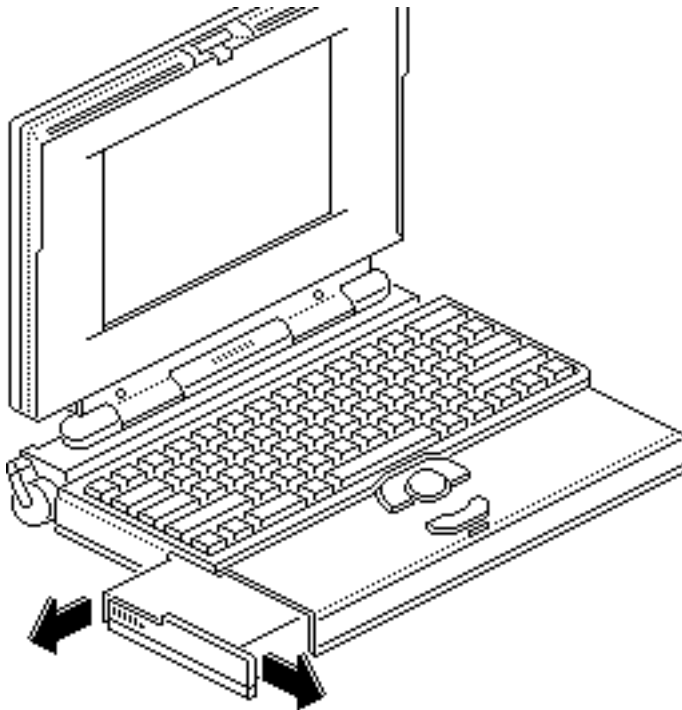
Main Battery

Before you begin, disconnect the power adapter.

Note: This procedure also covers removal of the main battery door.

Important: Before removing the main battery, use the Macintosh Shut Down command.

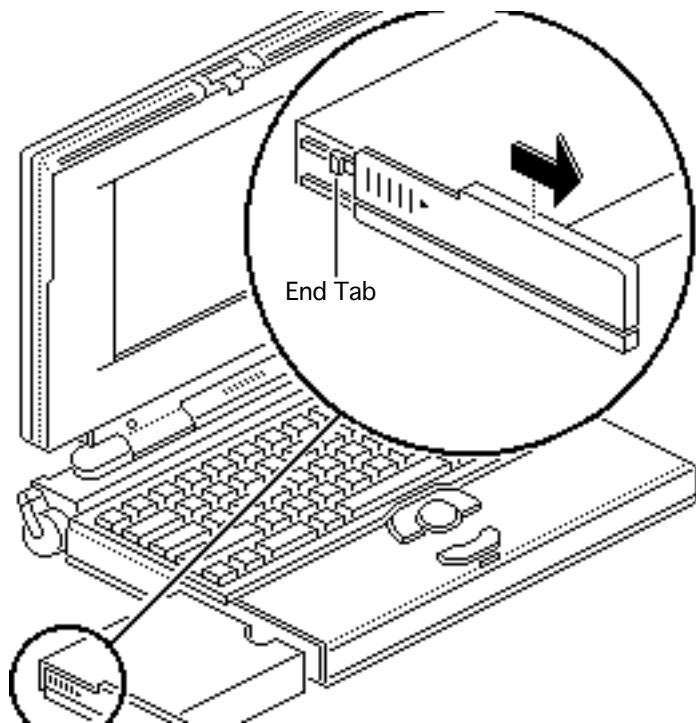




⚠ Warning: The main battery contains toxic materials. Review battery handling and disposal instructions in Bulletins/Safety.

- 1 Slide open the battery door.
- 2 Using the battery door as a handle, pull out the main battery.





- 3 Slide the battery door completely open.
- 4 Pull the end tab until it releases, and remove the door from the battery.

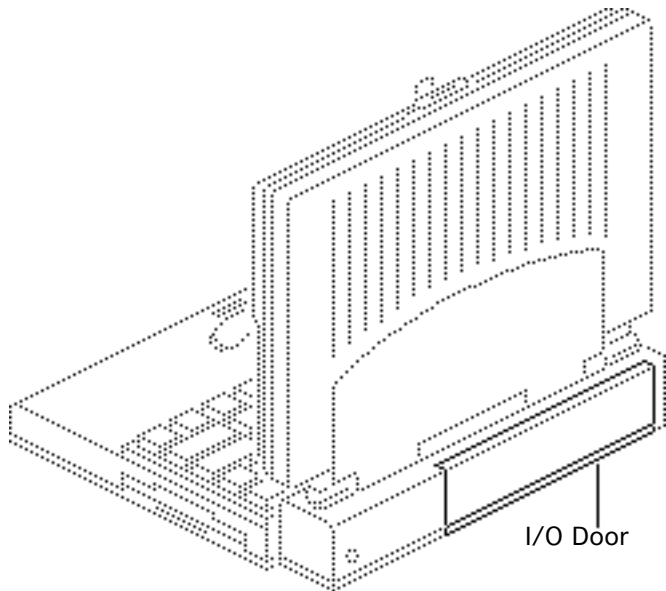


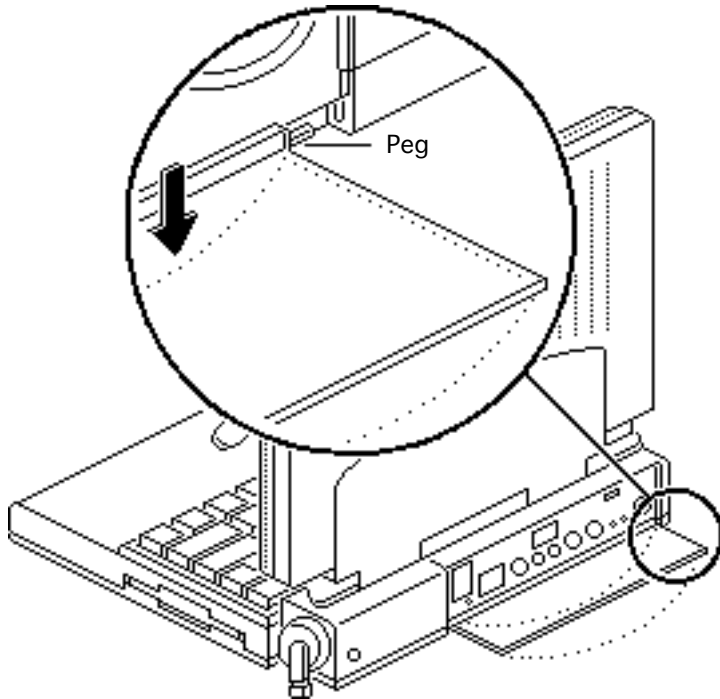


I/O Door

No preliminary steps are required before you begin this procedure.

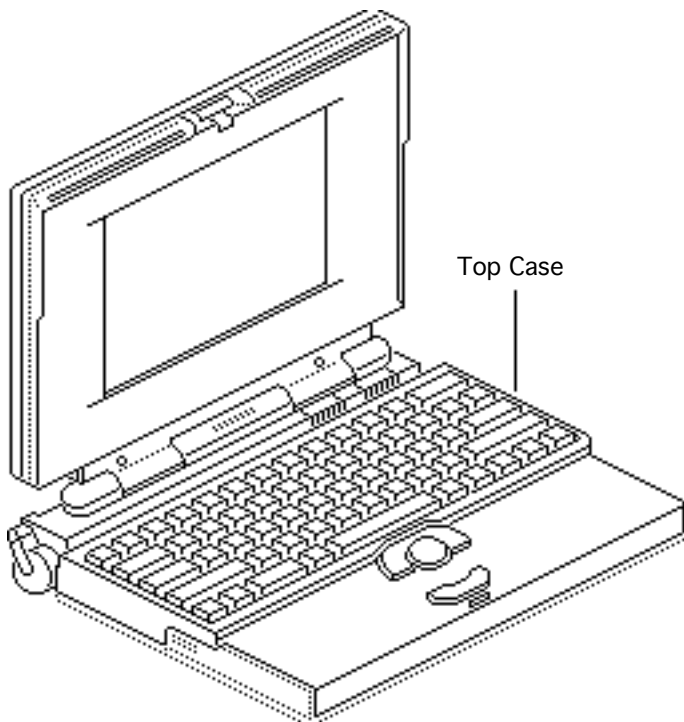
Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.





- 1 Open the I/O door.
- 2 Carefully bend the door so that the middle bows downward and unhook the two pegs located at the bottom corners.





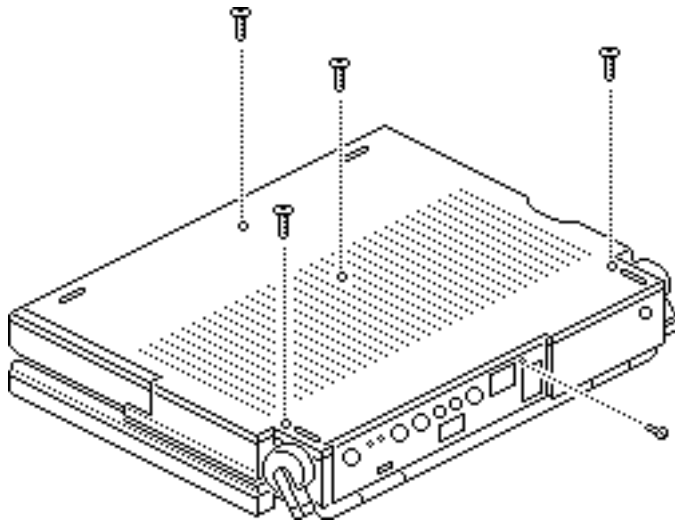
Top Case

Before you begin, remove the following:

- Main battery
- I/O door

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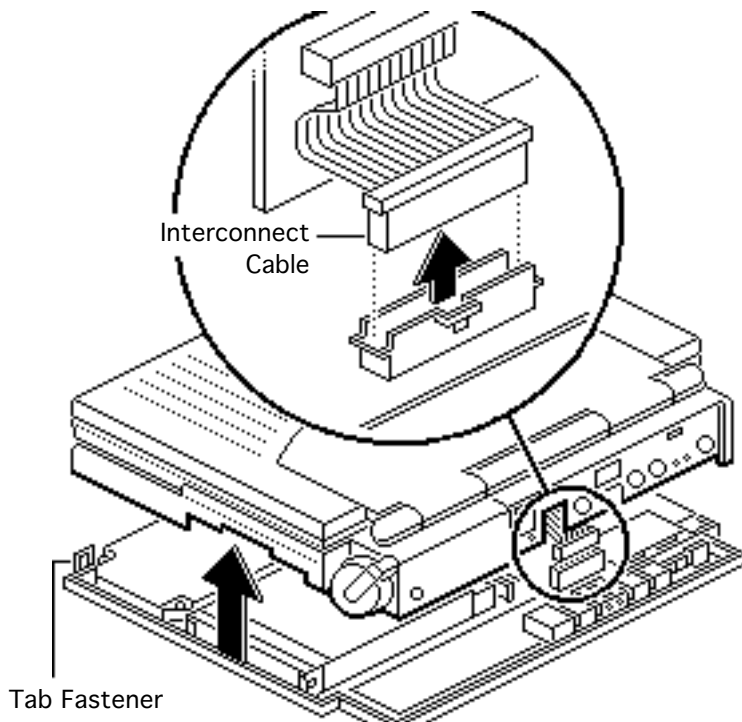




- 1 **Note:** Use a T-8 Torx driver to remove the small screw from the rear connector panel and a T-10 Torx driver to remove the other case screws.

Remove the five Torx screws from the bottom case.

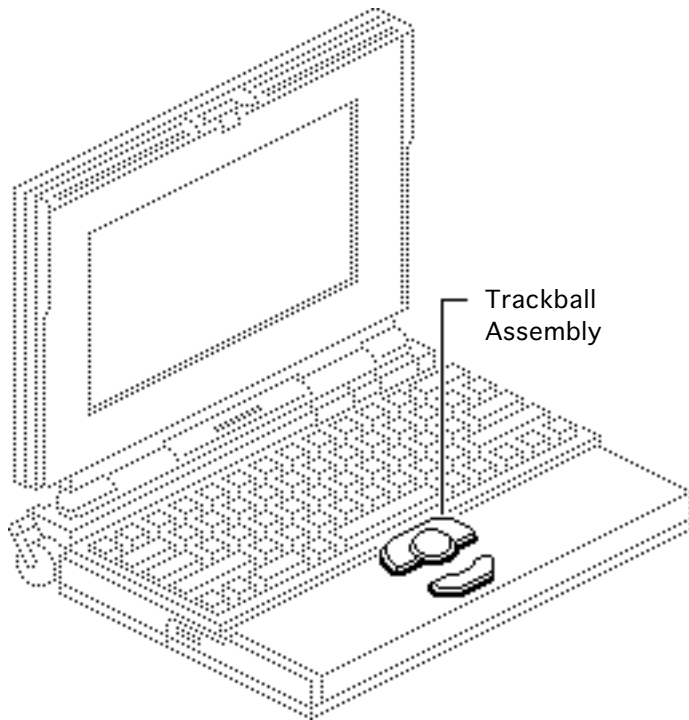




- 2 Lift the back of the top case and disconnect the interconnect cable.
- 3 Lift off the top case and unhook the two tab fasteners from the front of the bottom case.

Replacement Caution: When connecting the interconnect cable connector, fold the cable as shown. If it is not folded correctly, the cable could short.





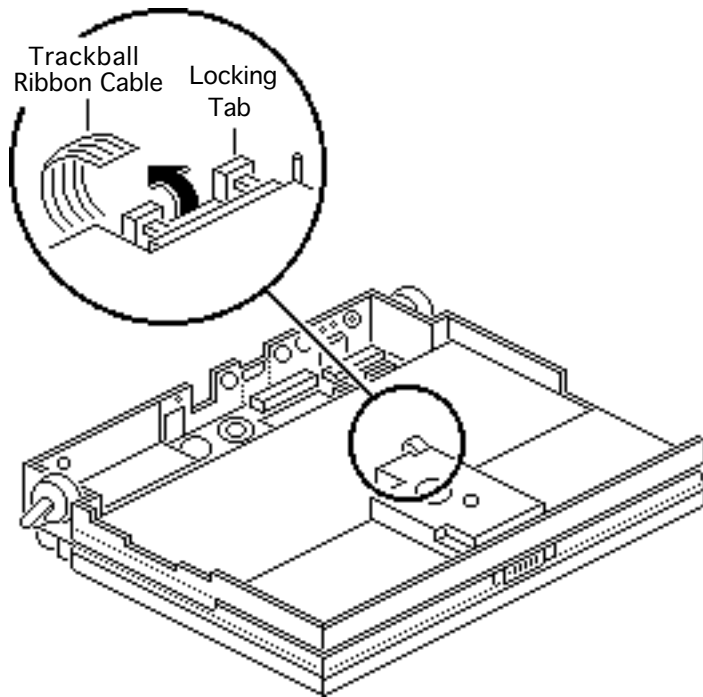
Trackball Assembly

Before you begin, remove the following:

- Main battery
- I/O door
- Top case

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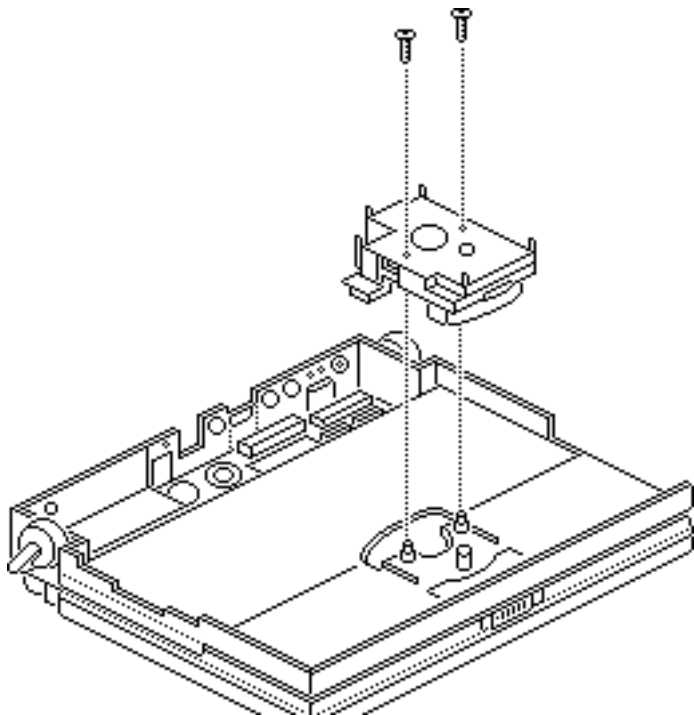




- 1 **Caution:** The trackball ribbon cable is fragile and should be handled with care.

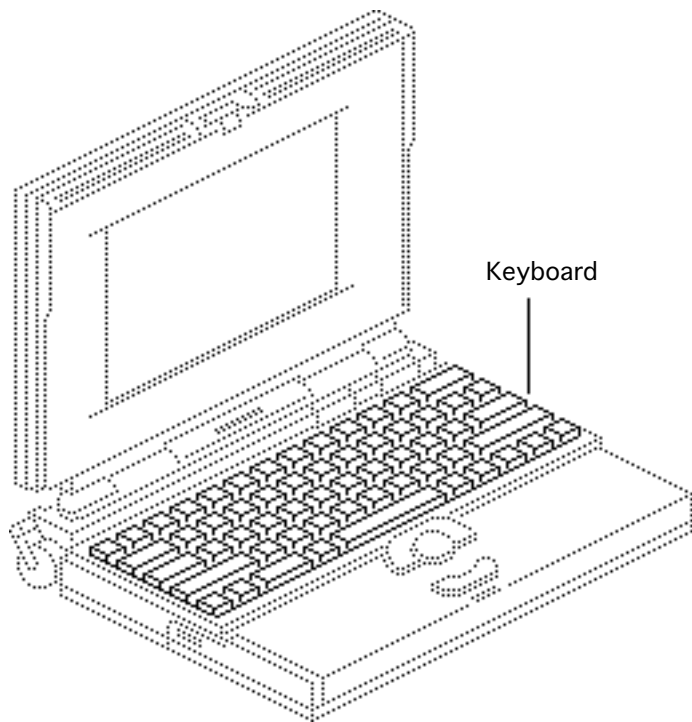
Pull out the locking tab on the trackball connector and disconnect the trackball ribbon cable.





- 2 Using a T-8 Torx driver, remove the two mounting screws and lift the trackball assembly from the top case.





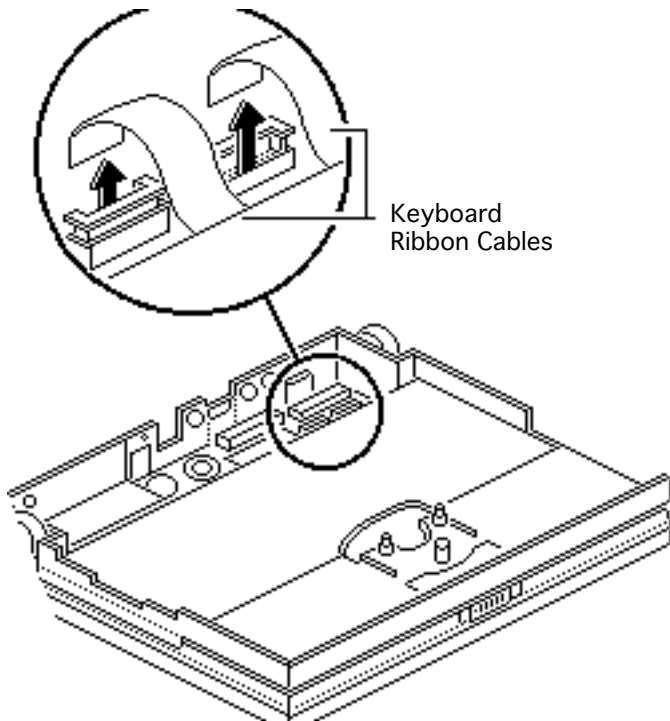
Keyboard

Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- Trackball assembly

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

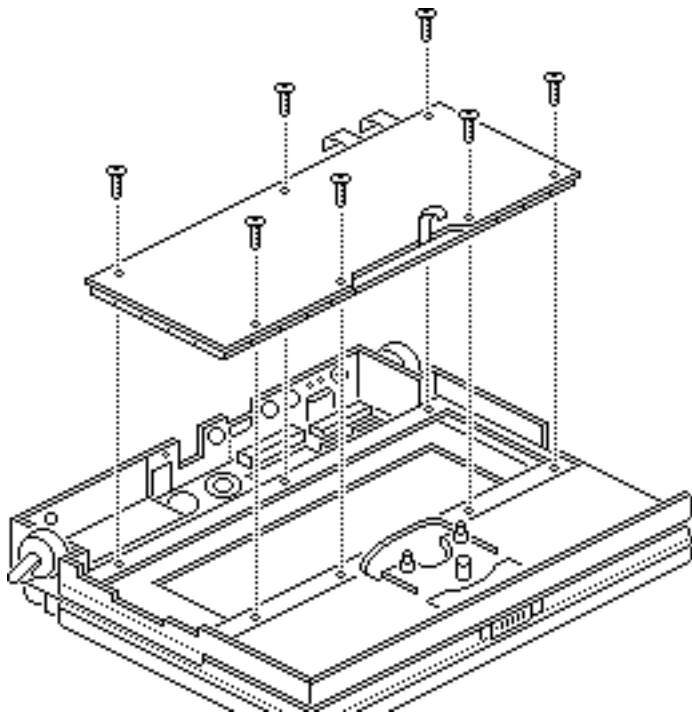




- 1 **Caution:** The keyboard ribbon cables are fragile and should be handled with care.

Lift the locking tabs on the two keyboard connectors and disconnect the keyboard ribbon cables.





- 2 Using a T-8 Torx driver, remove the seven mounting screws and lift the keyboard from the top case.



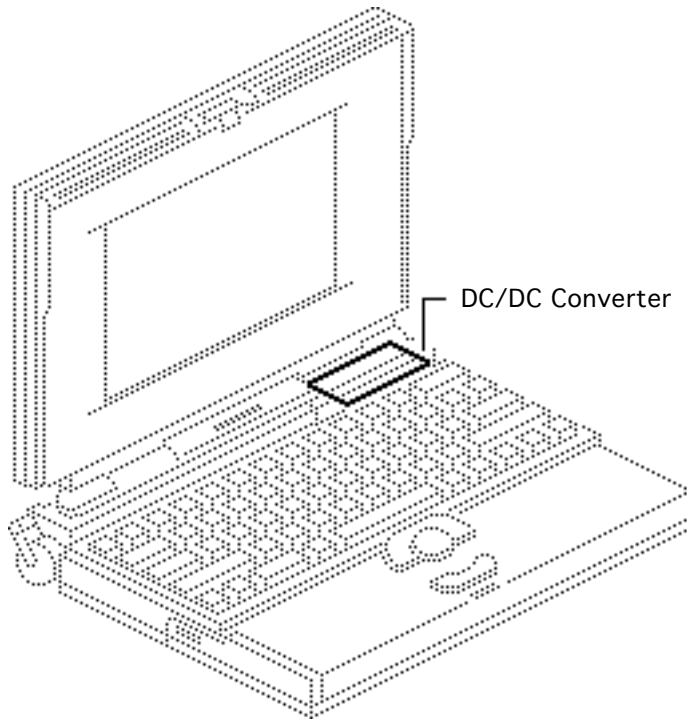


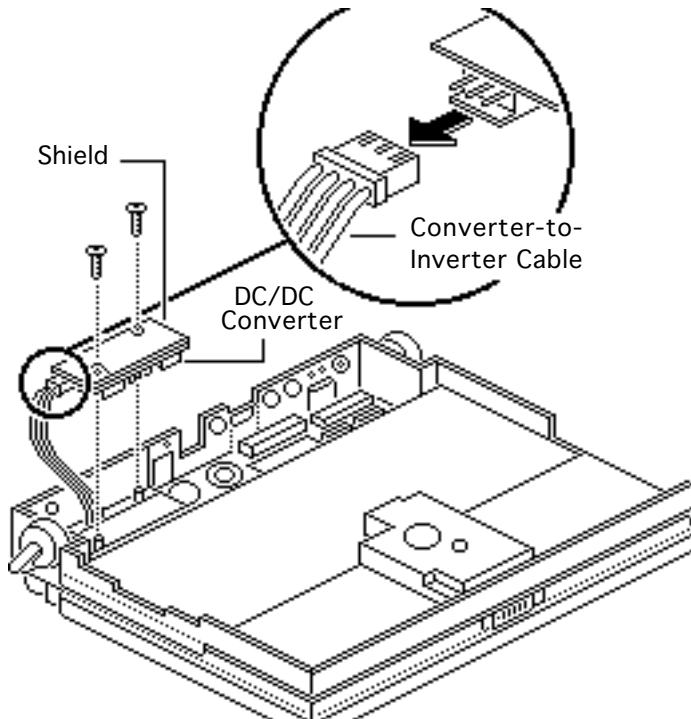
DC/DC Converter

Before you begin, remove the following:

- Main battery
- I/O door
- Top case

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



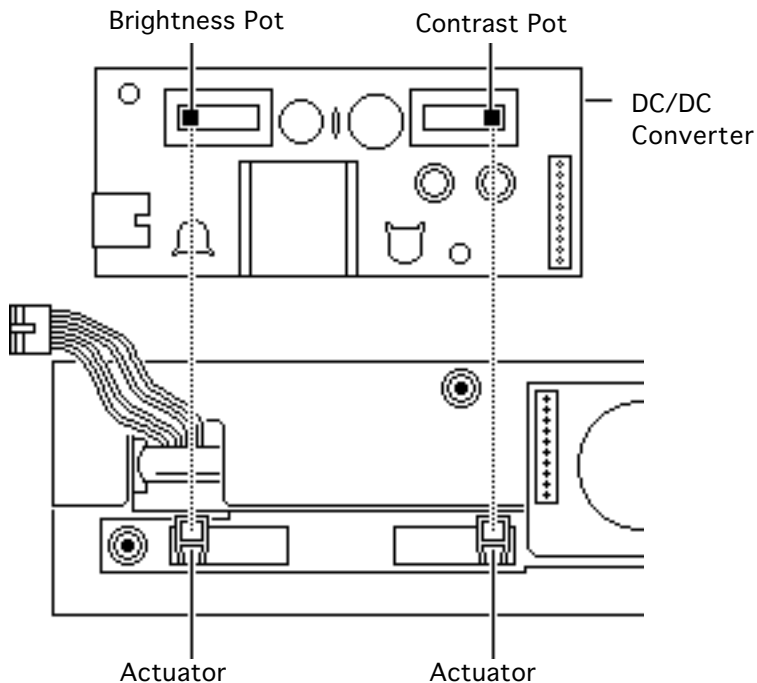


- 1 Remove the two mounting screws.
- 2 **Note:** Do not remove the shield from the DC/DC converter.

Pull the DC/DC converter and attached shield straight up and off the connector on the interconnect board.

- 3 Disconnect the converter-to-inverter cable.

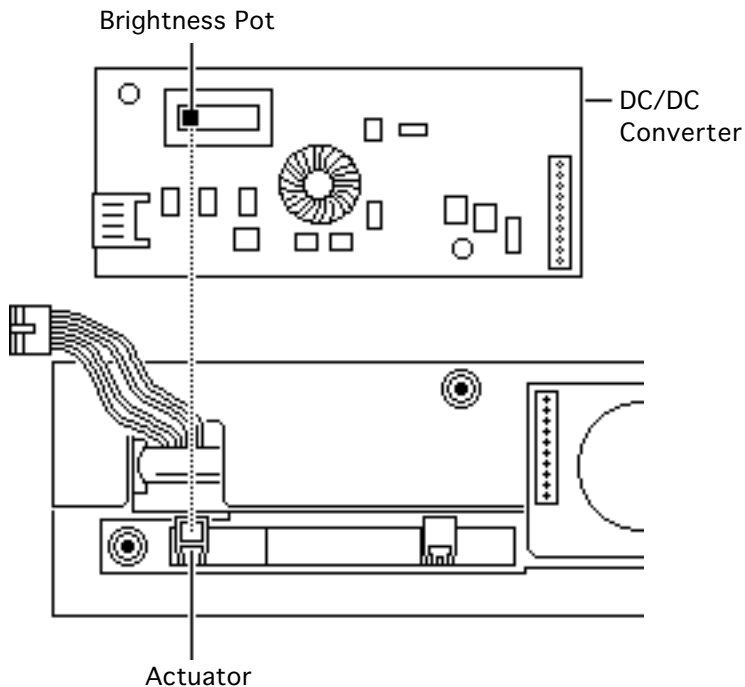




PowerBook 165c

Replacement Note: Be sure to align the brightness and contrast pots on the DC/DC converter with the plastic actuators on the top case. It is easiest to align the pots and actuators if you set both to their extreme outer positions.

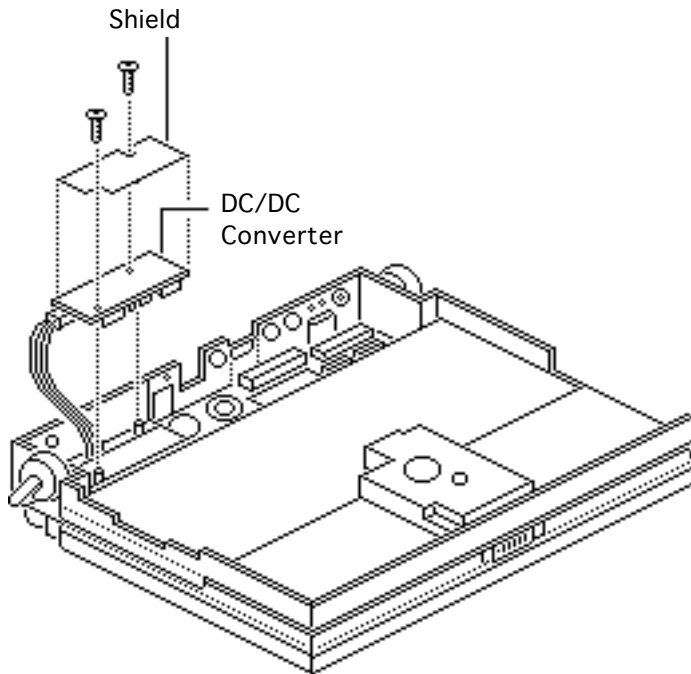




PowerBook 180c

Replacement Note: Be sure to align the brightness pot on the DC/DC converter with the plastic actuator on the top case. It is easiest to align the pot and actuator if you set both to their extreme outer positions.





Replacement Note: If you are replacing the DC/DC converter, order both the converter and its shield (part number 922-0418). Install the new shield on the converter before replacing it. Do not reuse the original shield.



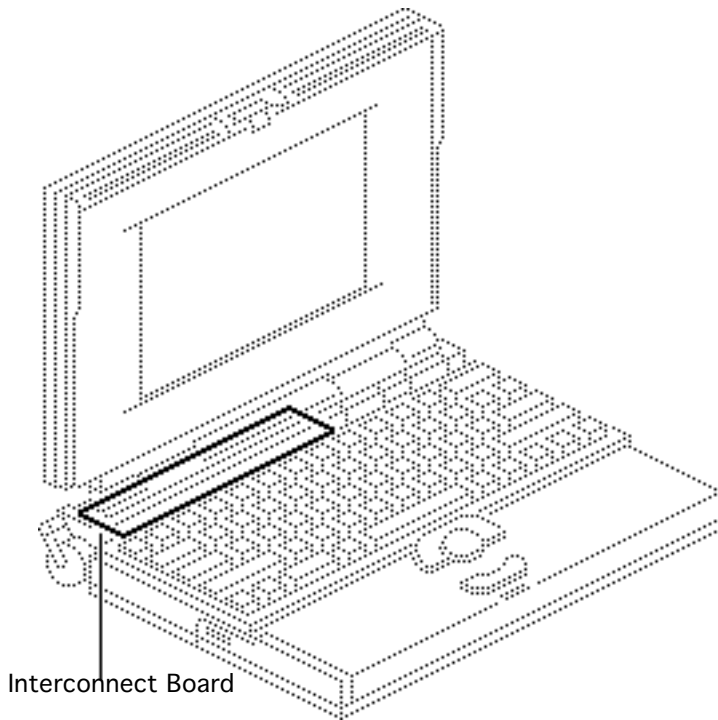


Interconnect Board

Before you begin, remove the following:

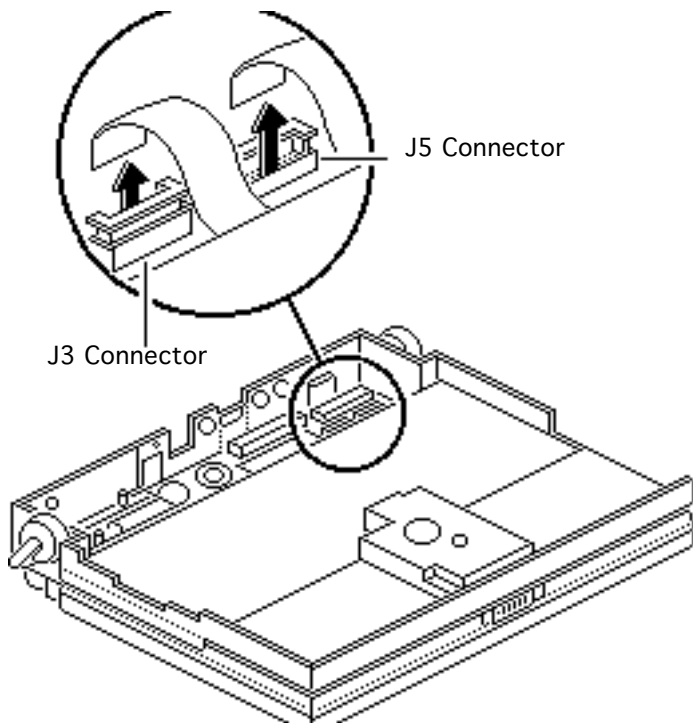
- Main battery
- I/O door
- Top case
- DC/DC converter

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



Interconnect Board



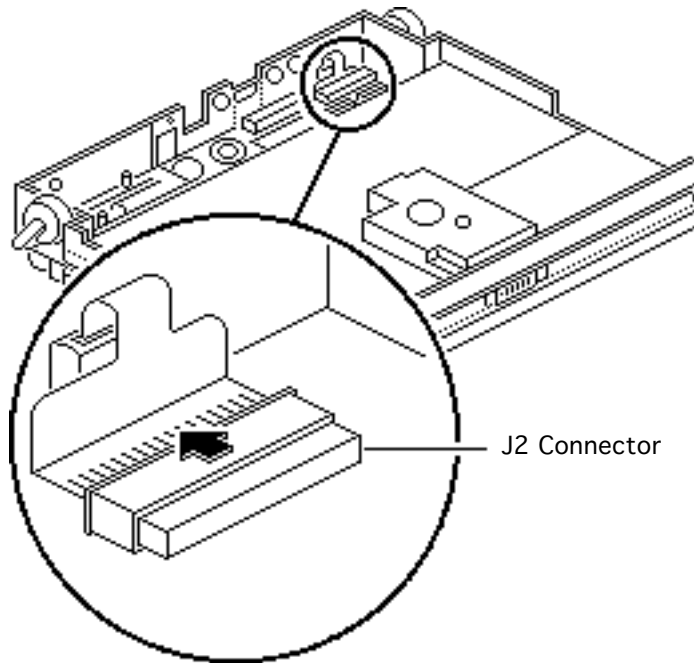


⚠ Warning: The interconnect board contains hazardous materials. Return bad interconnect boards to Apple for proper disposal.

- 1 **Caution:** The keyboard and display cables are fragile and should be handled with care.

Lift the locking tabs on connectors J5 and J3 and disconnect the keyboard ribbon cables.



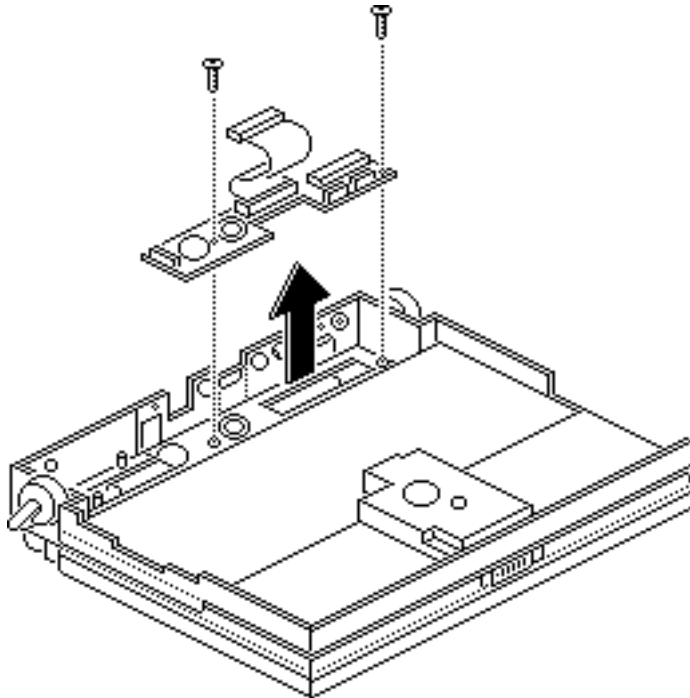


- Note:** The display cable will not come entirely out of the connector until you remove the interconnect board from the top case.

Pull out the locking tab on connector J2 and ease the display cable out of the connector as far as the cable will go.

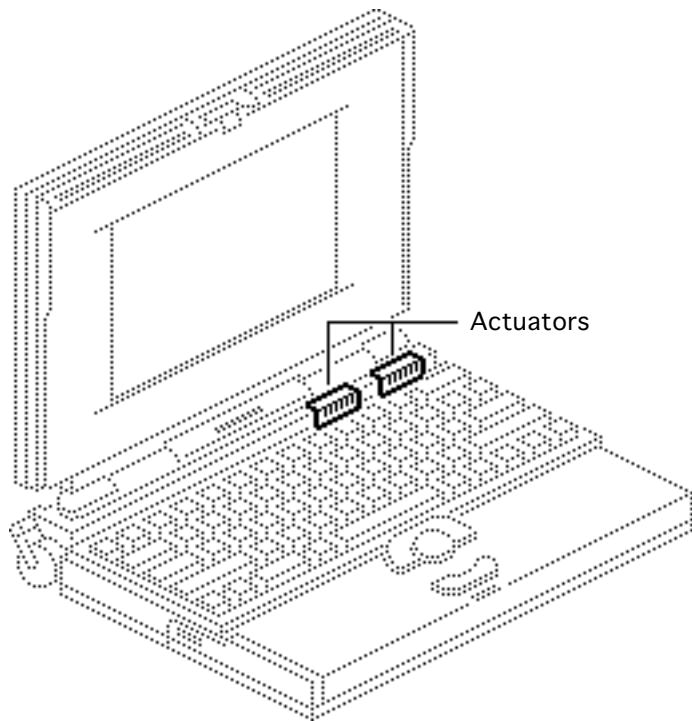
Replacement Note: Connect the display cable before replacing the interconnect board.





- 3 Using a T-8 Torx driver, remove the two mounting screws and lift the interconnect board from the top case.





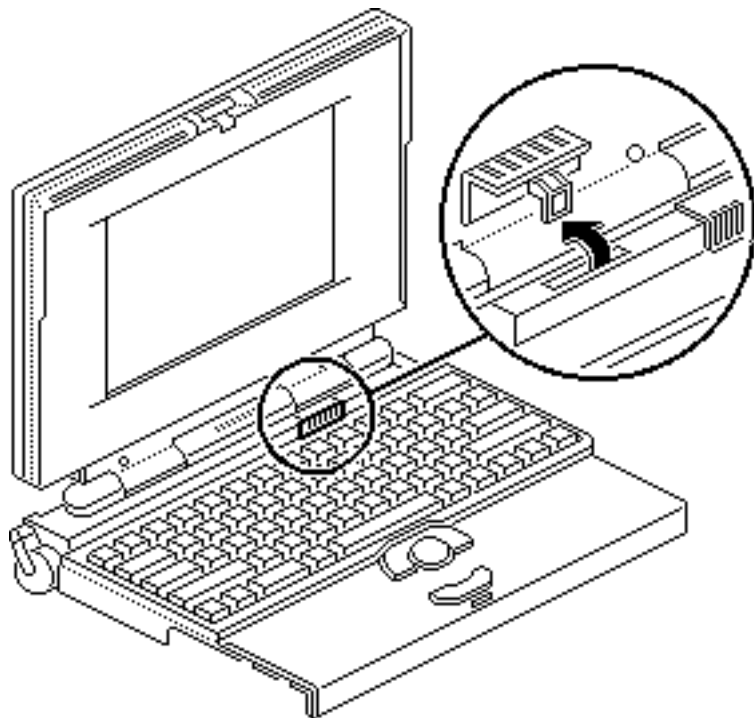
Actuators

Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- DC/DC converter

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.





Replacement Note: The PowerBook 180c has only one brightness actuator.

- 1 Pull up the contrast actuator, rotate it toward the display, and remove the actuator from the top case.
- 2 Repeat for the brightness actuator.



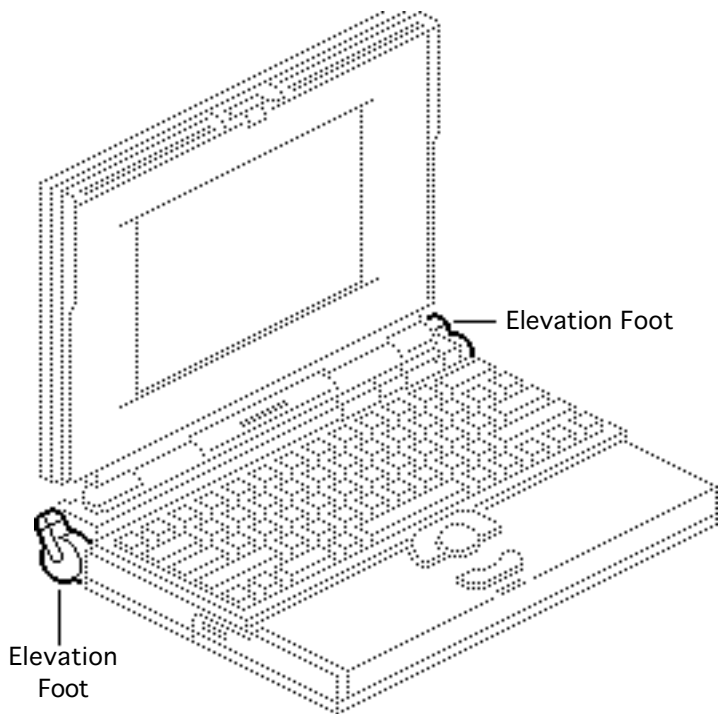


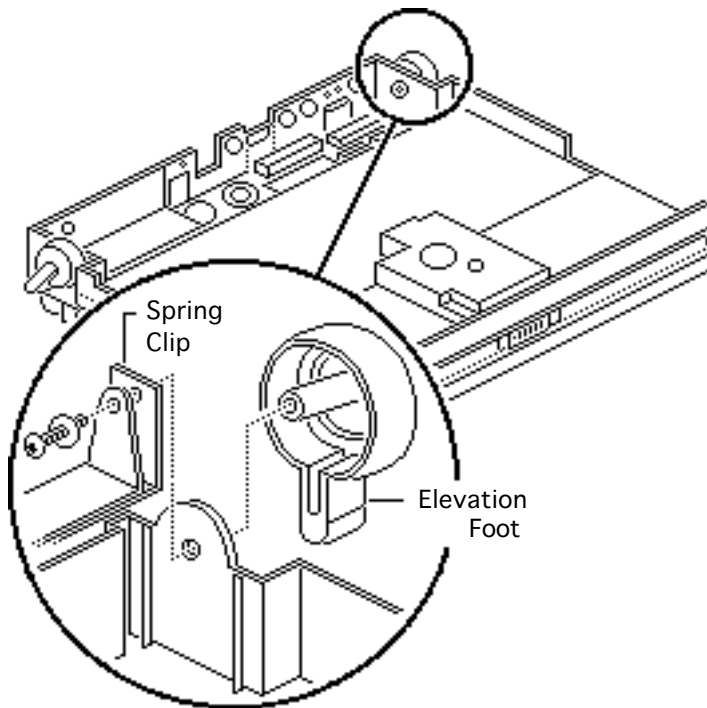
Elevation Foot

Before you begin, remove the following:

- Main battery
- I/O door
- Top case

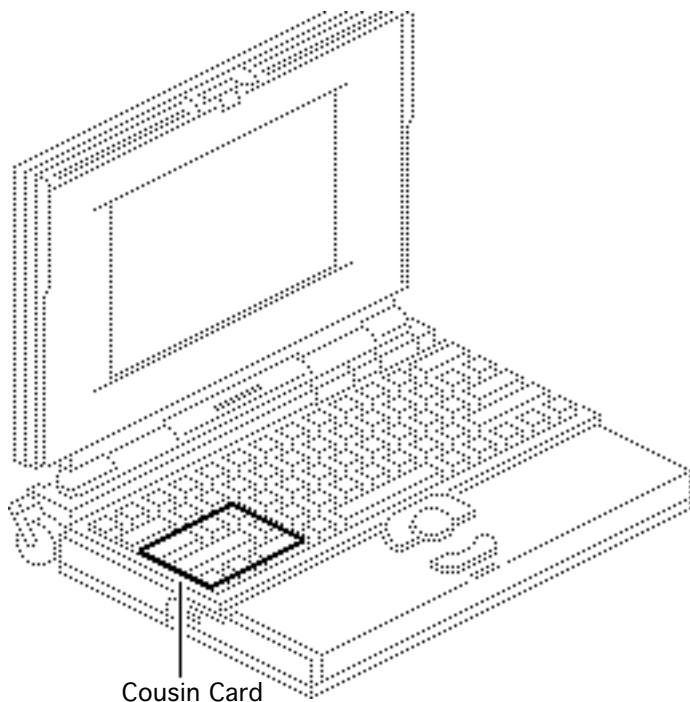
Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.





- 1 Using a T-8 Torx driver, remove the Torx screw, washer, and spring clip from the inside of the elevation foot.
- 2 Pull off the elevation foot.





Cousin Card

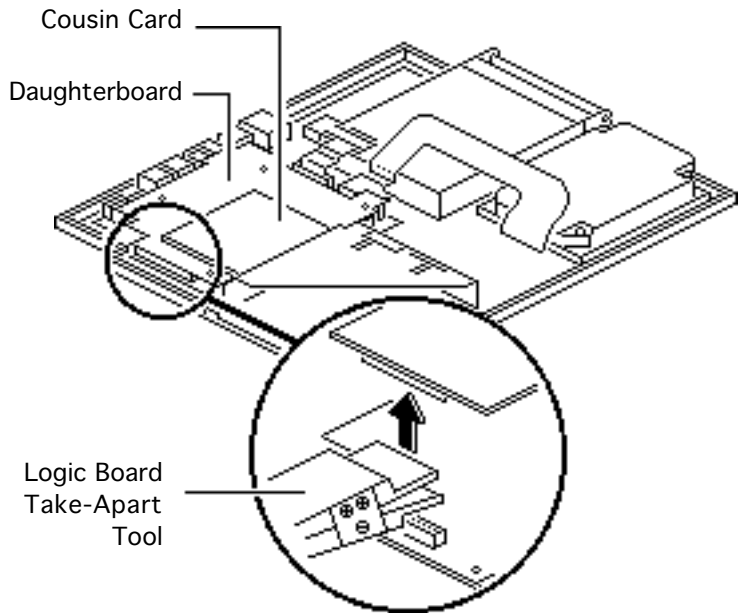
Cousin Card

Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- PSRAM expansion card (if present)

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

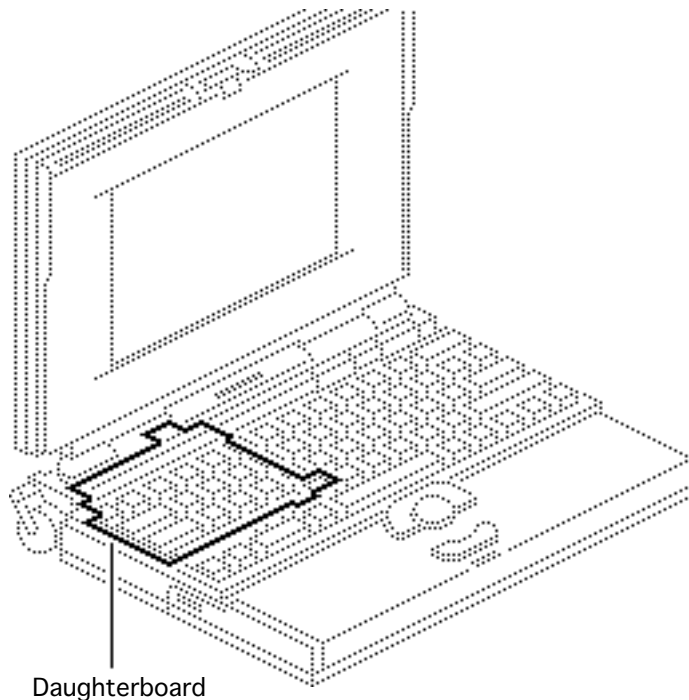




Caution: Always use the logic board take-apart tool to separate the cousin card connector from the daughterboard connector. Trying to disconnect the cousin card from the daughterboard by rocking or peeling the boards apart damages the connectors.

Using the Apple logic board take-apart tool, disconnect the cousin card from the daughterboard.





Daughterboard

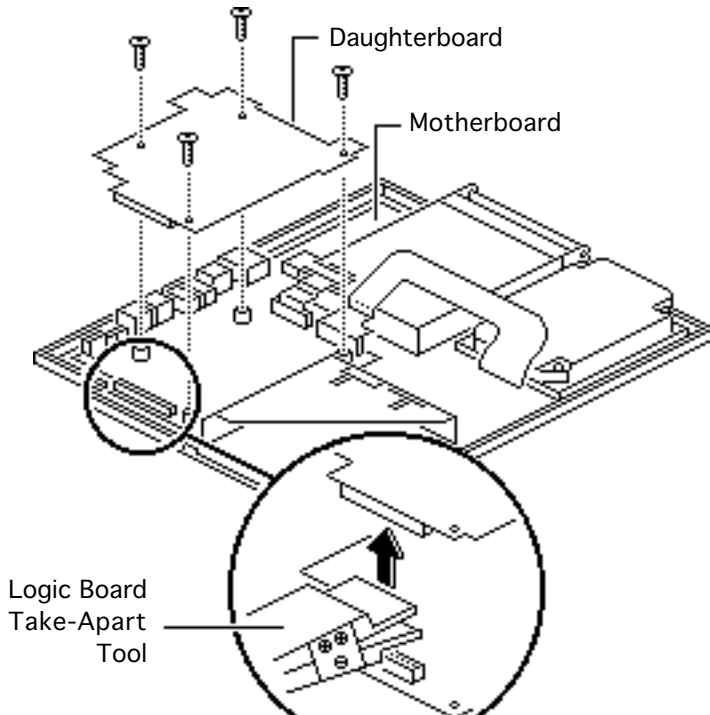
Daughterboard

Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- PSRAM expansion card (if present)
- Cousin card

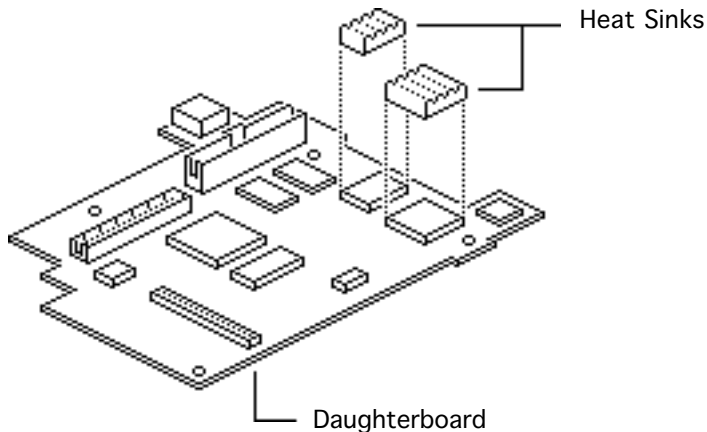
Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.





- 1 Using a T-8 Torx driver, remove the four daughterboard mounting screws.
- 2 **Caution:** Always use the logic board take-apart tool to separate the daughterboard connector from the motherboard connector. Trying to disconnect the daughterboard from the motherboard by rocking or peeling the boards apart damages the connectors.





Using the Apple logic board take-apart tool, disconnect the daughterboard from the motherboard.

Replacement Note: The green heat sinks attached to the daughterboard are made of delicate heat-conducting material. If they are missing or damaged, they must be replaced.

Replacement Note: To replace a damaged heat sink, carefully peel it from the daughterboard. Select the





appropriately sized heat sink from the heat sink kit (part number 076-0069), and gently press the part into place.

Replacement Caution: Make sure the heat sink is placed exactly as shown in the illustration. The heat sink should not hang over the side of the component it is covering, or it may short the component leads.



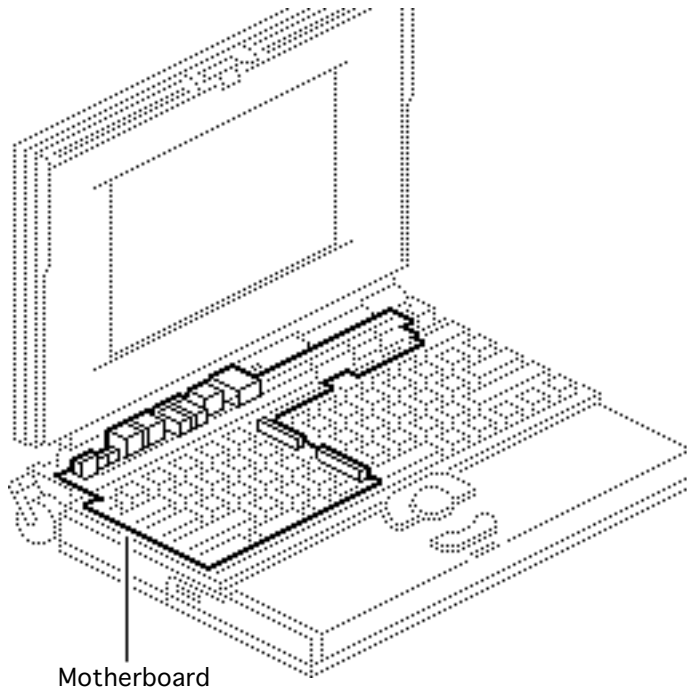


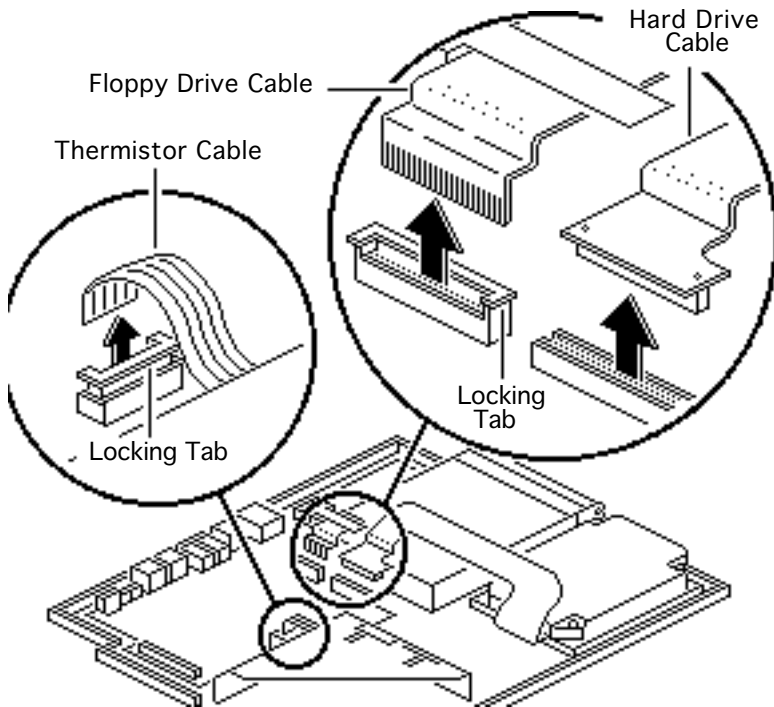
Motherboard

Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- PSRAM expansion card (if present)
- Cousin card
- Daughterboard
- Modem card (if present)

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage.



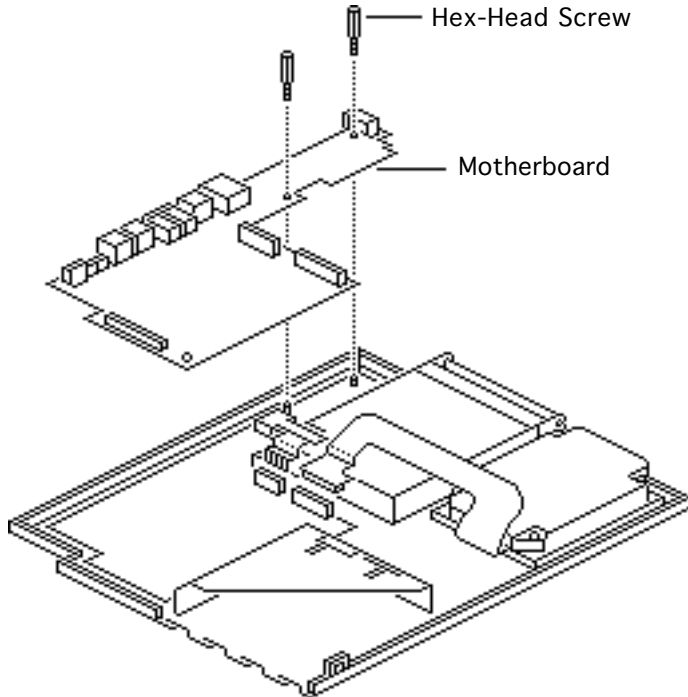


Review the ESD precautions in Bulletins/Safety.

Caution: The hard drive, floppy drive, and thermistor cables are fragile and should be handled with care.

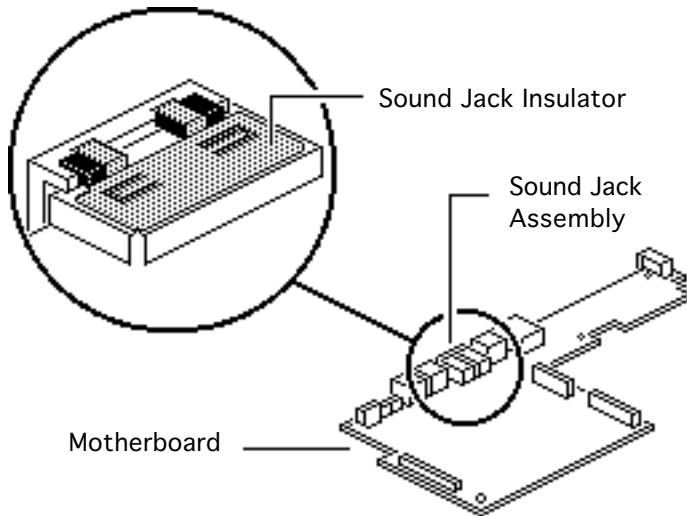
- 1 Lift the locking tabs and disconnect the floppy drive and thermistor cables.
- 2 Remove the hard drive cable.





- 3 Remove the two hex-head screws and lift the motherboard from the bottom case.





Replacement Note: To replace the insulator on the sound jack assembly, carefully peel off the original insulator. Remove the paper backing on the replacement insulator, and gently press it into place.

Replacement Caution: Make sure the replacement insulator sits in exactly the same position as the original insulator.



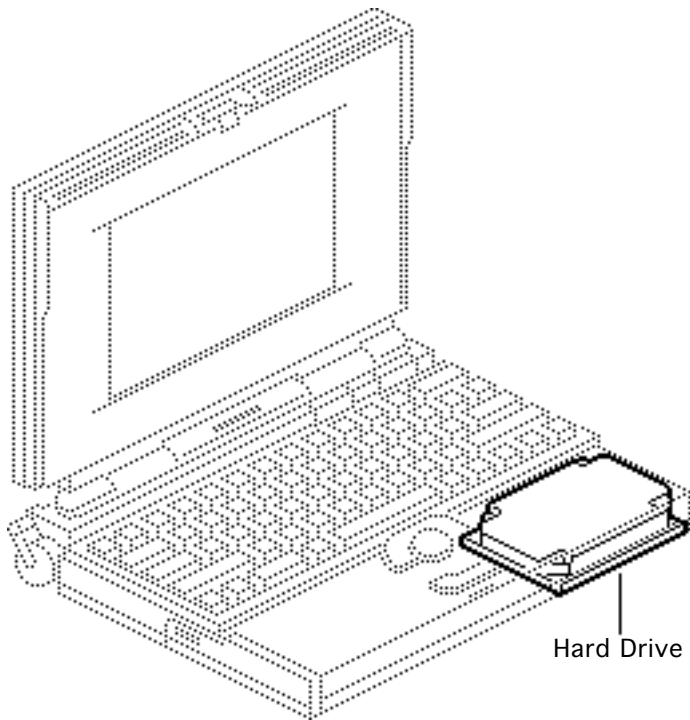


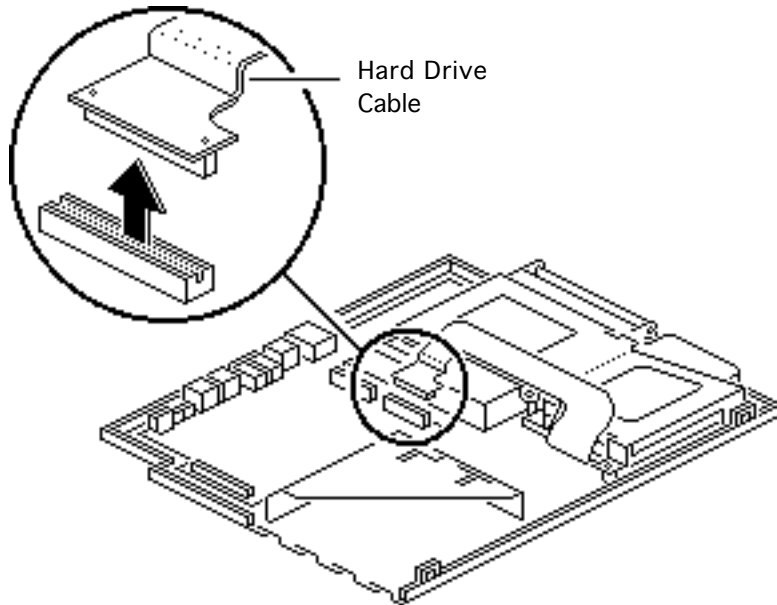
Hard Drive

Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- Modem card (if present)
- PSRAM expansion card (if present)
- Cousin card
- Daughterboard

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage.



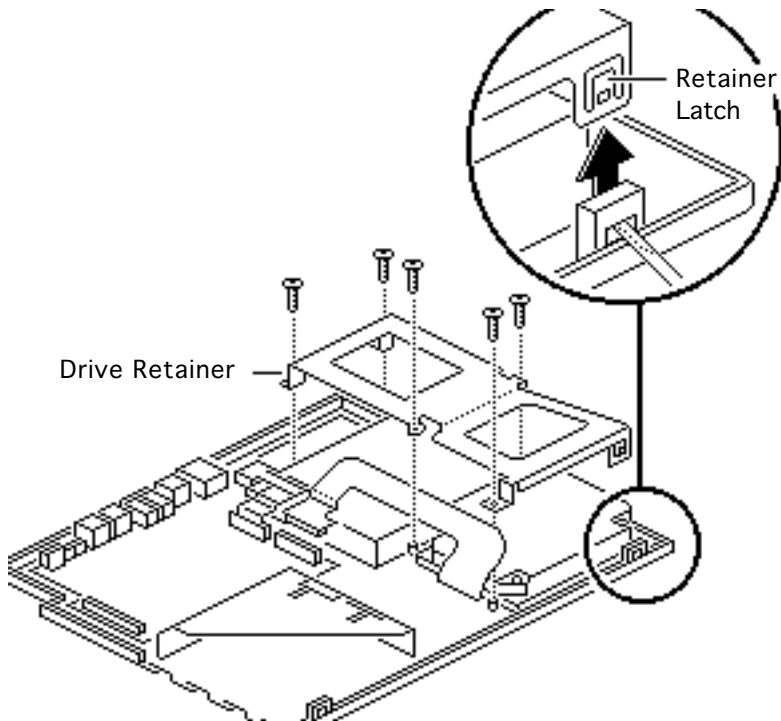


Review the ESD precautions in Bulletins/Safety.

- 1 **Caution:** The hard drive cable is fragile and should be handled with care.

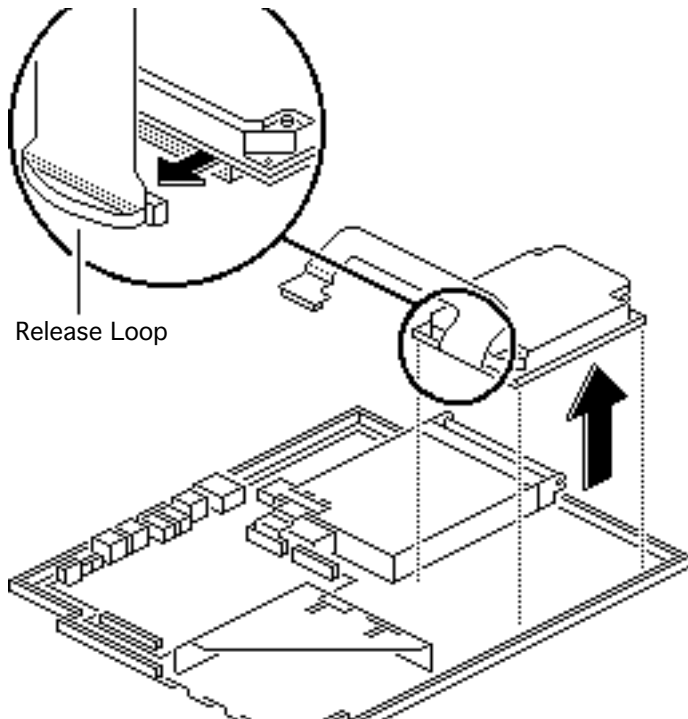
Disconnect the hard drive cable from the motherboard.





- 2 Using a T-8 Torx driver, remove the five screws from the drive retainer.
- 3 Using a jeweler's screwdriver, release the drive retainer latch and remove the retainer.





- 4 Lift the hard drive from the case.
- 5 Pull the release loop and disconnect the hard drive cable.

Note: If the cable does not have a release loop, gently pry the cable from the drive with a screwdriver.

Replacement Note: For information on returning drives, cables, and carriers to Apple, refer to the Hard Drives manual.

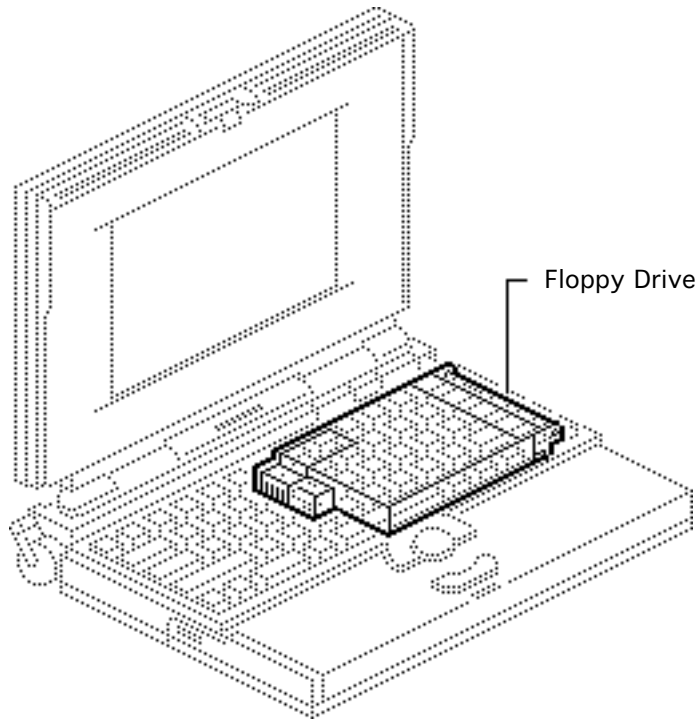




Floppy Drive

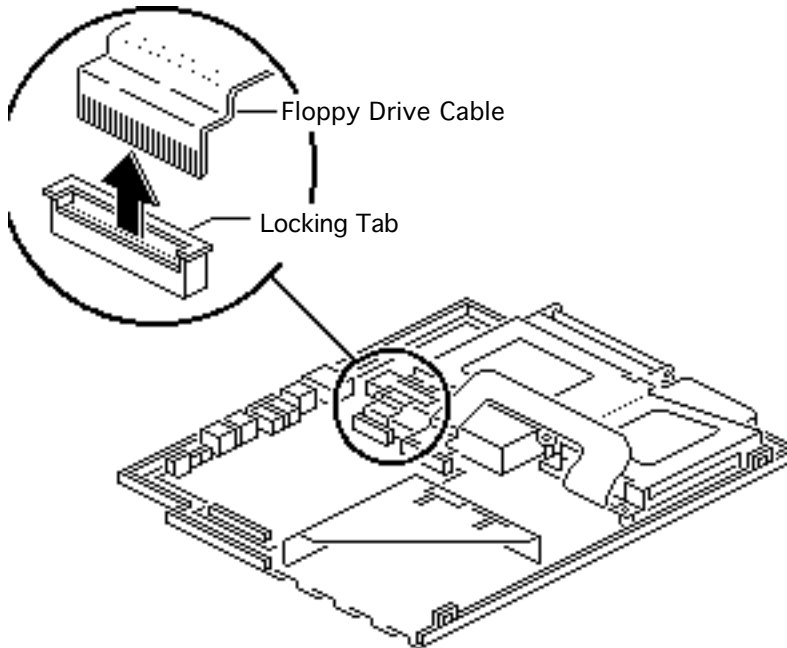
Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- Modem card (if present)
- PSRAM expansion card (if present)
- Cousin card
- Daughterboard



Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage.



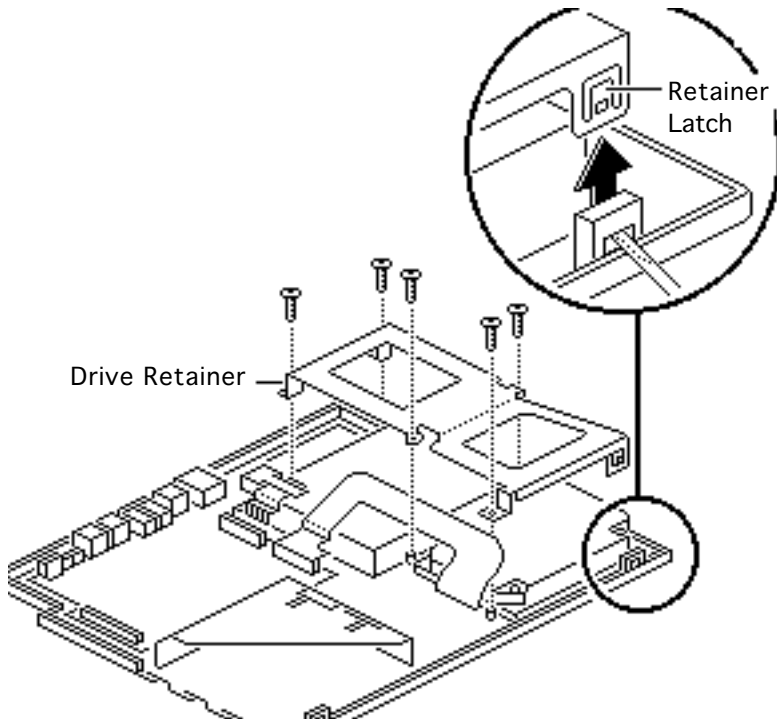


Review the ESD precautions in Bulletins/Safety.

- 1 **Caution:** The floppy drive cable is fragile and should be handled with care.

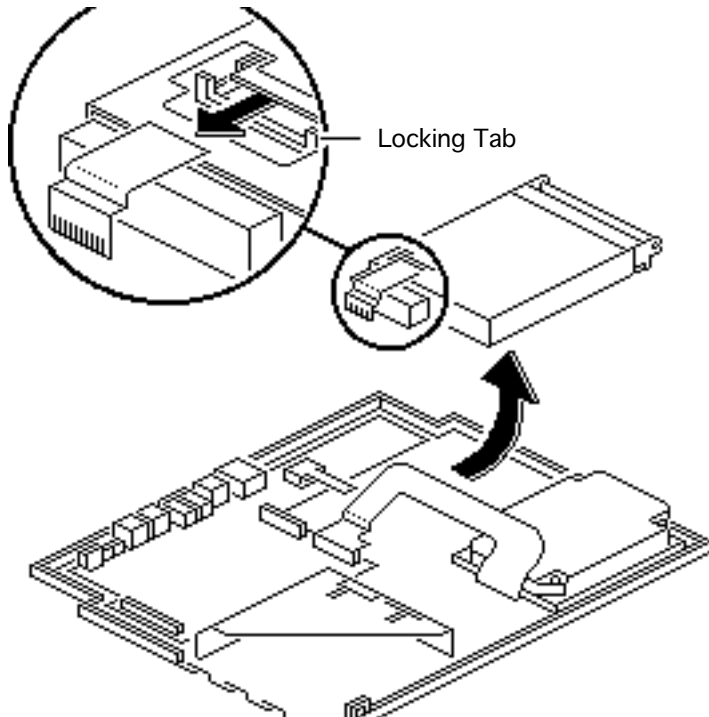
Lift the locking tab and disconnect the floppy drive cable from the motherboard.





- 2 Using a T-8 Torx driver, remove the five Torx screws from the drive retainer.
- 3 Using a jeweler's screwdriver, release the drive retainer latch and remove the retainer.





- 4 Slide the floppy drive back and lift it from the bottom case.
- 5 Using a jeweler's screwdriver, push out the locking tab and disconnect the floppy drive cable from the drive.

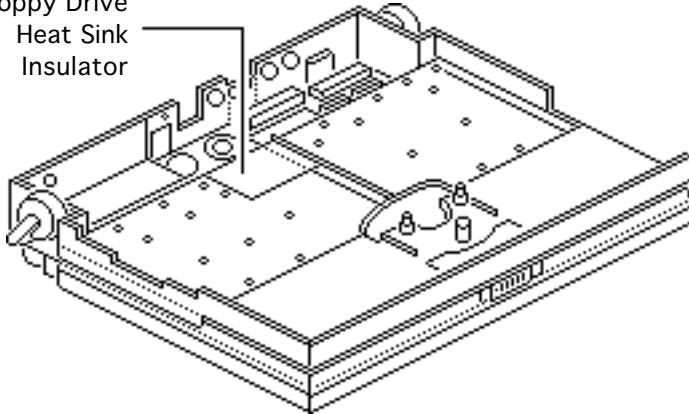
Replacement Caution: When connecting the floppy drive cable connector, fold the cable as shown. If it is not folded correctly, the cable could short.





PowerBook 165c

Floppy Drive
Heat Sink
Insulator



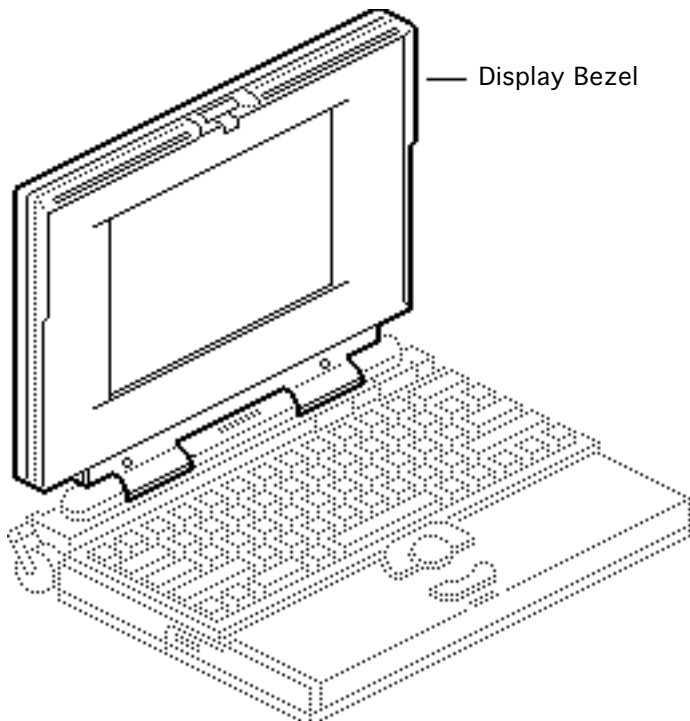
Replacement Note: The insulator for the floppy drive heat sink is a transparent mylar sheet attached to the underside of the keyboard. To replace the insulator, carefully peel off the original insulator. Remove the paper backing on the replacement insulator, and gently press it into place.





Replacement Caution: Make sure the replacement insulator sits in exactly the same position as the original insulator.



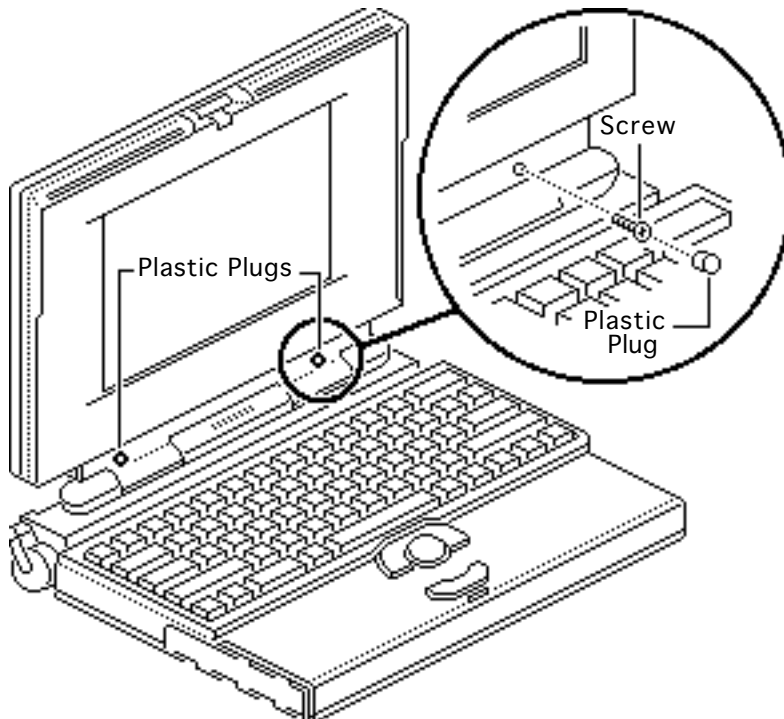


Display Bezel

Before you begin, remove the main battery.

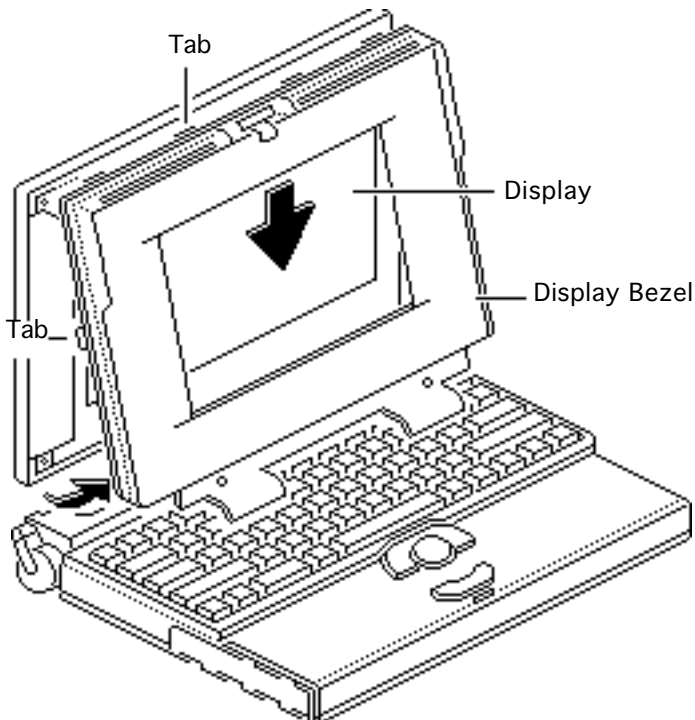
Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.





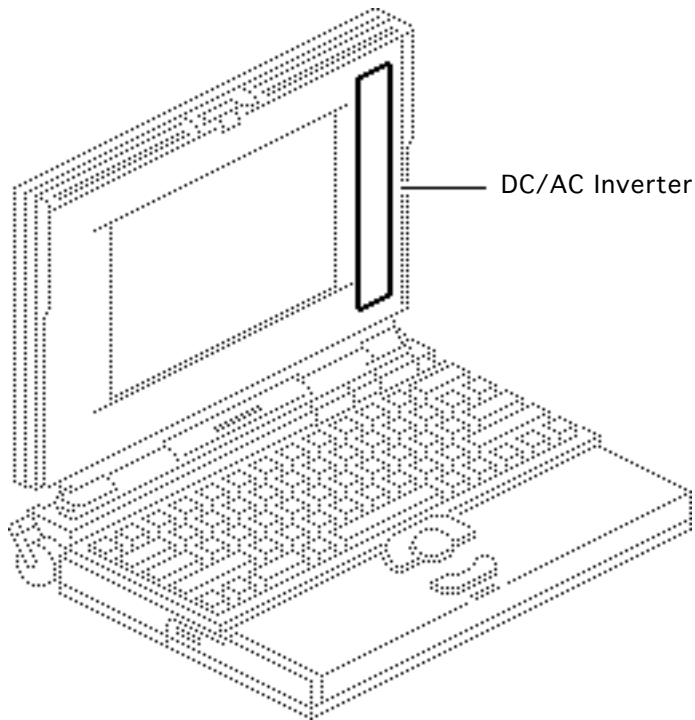
- 1 Remove the two plastic plugs.
- 2 Using a T-8 Torx driver, remove the two bezel mounting screws from the display.





- 3 Pull the display bezel down and away from the display and release the bezel from the mounting tabs at the top and sides of the display.
- 4 Lift the bezel off the display.





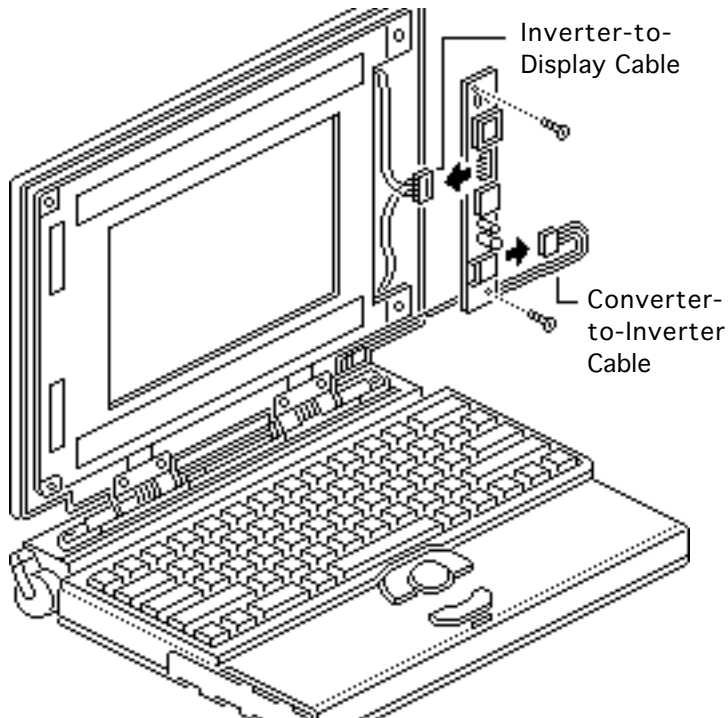
DC/AC Inverter

Before you begin, remove the following:

- Main battery
- Display bezel

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.





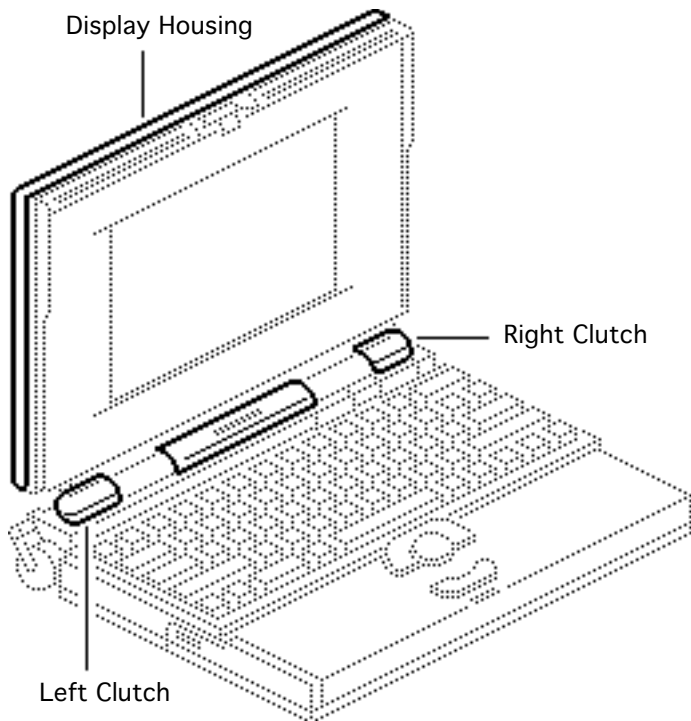
- 1 Disconnect the inverter-to-display cable from the DC/AC inverter.
- 2 Using a Phillips #0 screwdriver, remove the two screws.
- 3 Lift the DC/AC inverter off the display housing.
- 4 Disconnect the converter-to-inverter cable.





Replacement Note: To avoid pinching the converter-to-inverter cable, route the cable around the bottom right corner of the display.





Clutches/Display Housing

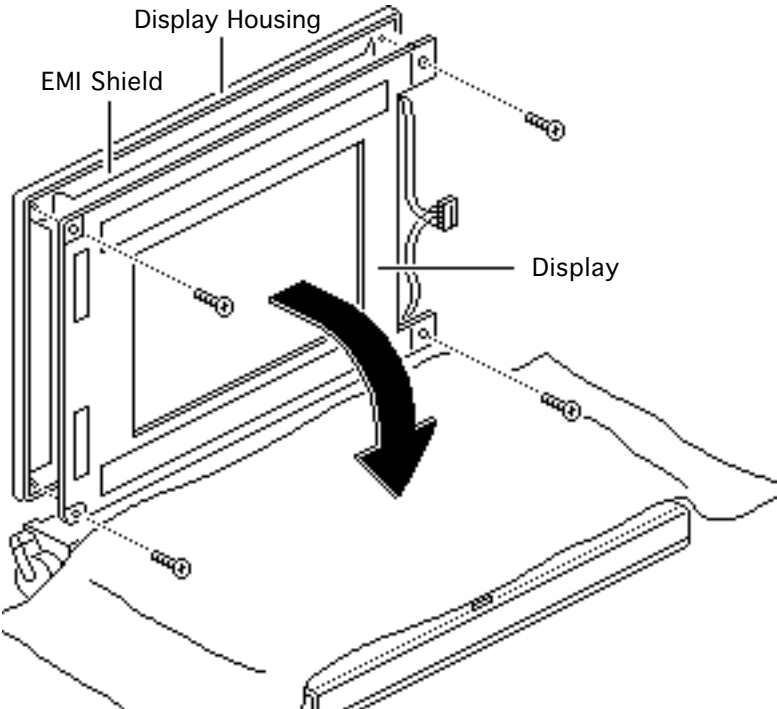
Before you begin, remove the following:

- Main battery
- Display bezel
- DC/AC inverter

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

Note: This topic includes take-apart procedures for

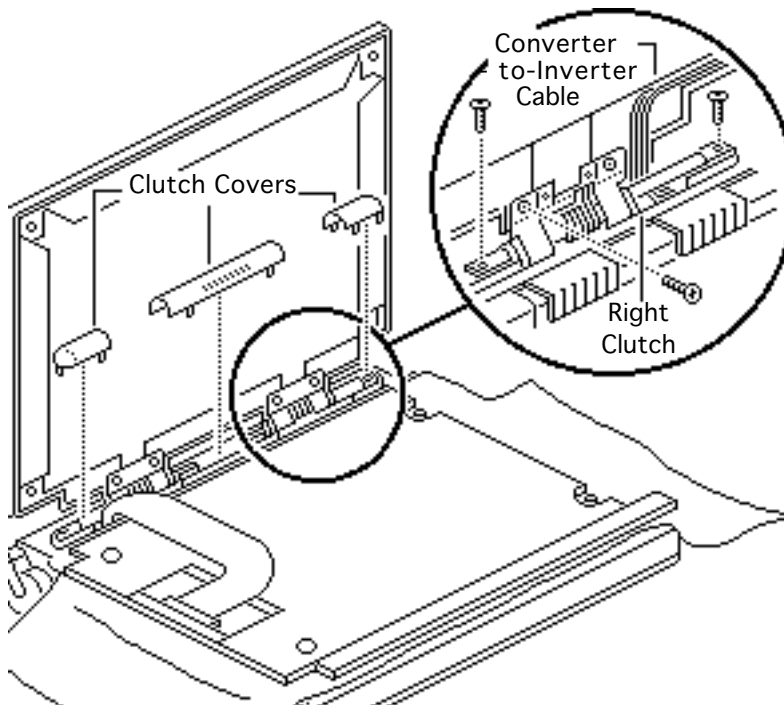




the left and right clutch assemblies and the display housing.

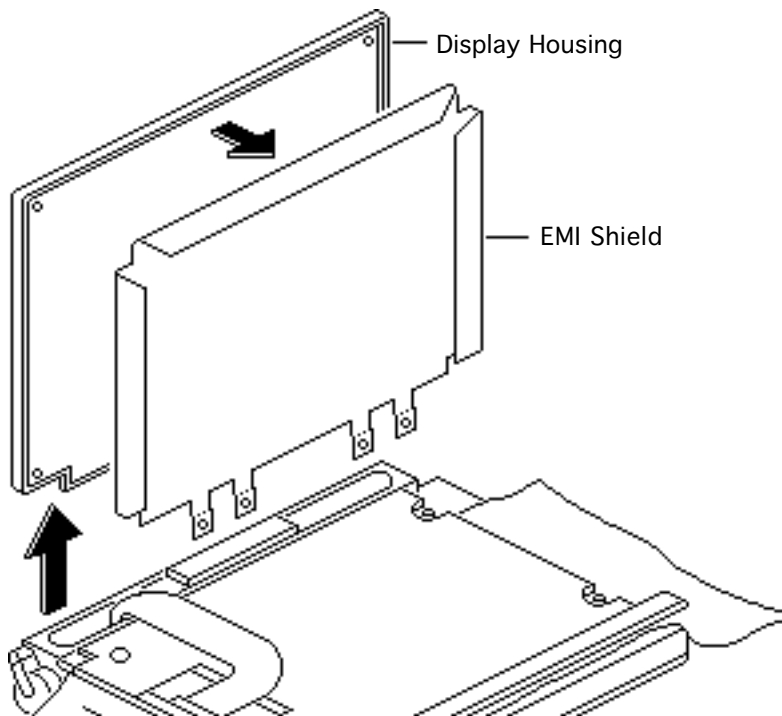
- 1 Cover the keyboard with a clean cloth or sheet of paper.
- 2 Using a T-8 Torx driver, remove the four display mounting screws.





- 3 Remove the display from the housing and EMI shield.
- 4 Place the display face-down on the keyboard.
- 5 Pull off the three clutch covers.
- 6 Using a T-8 Torx driver, remove the six mounting screws from the left and right clutches.
- 7 Remove the left and right clutches from the display housing.

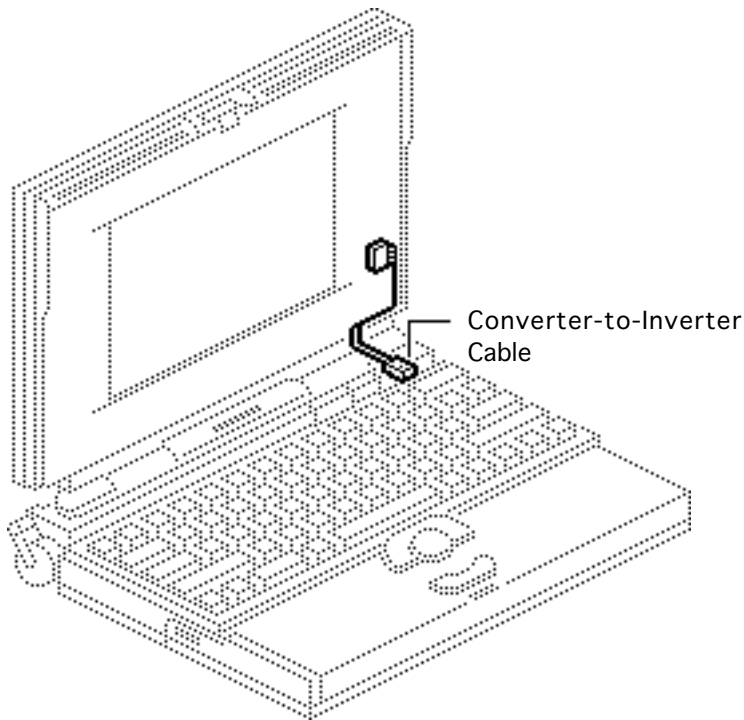




Replacement Note: Replace the short mounting screws in the top-inside clutch threadings. The top-outside threadings are used to mount the bezel.

- 8 Remove the display housing and EMI shield from the case.





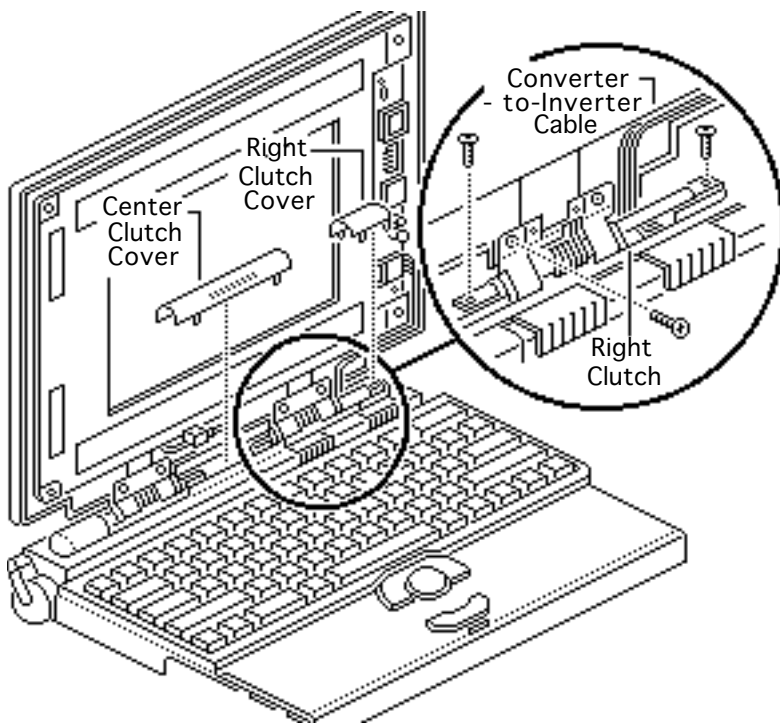
Converter-to-Inverter Cable

Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- DC/DC converter
- Display bezel
- DC/AC inverter

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

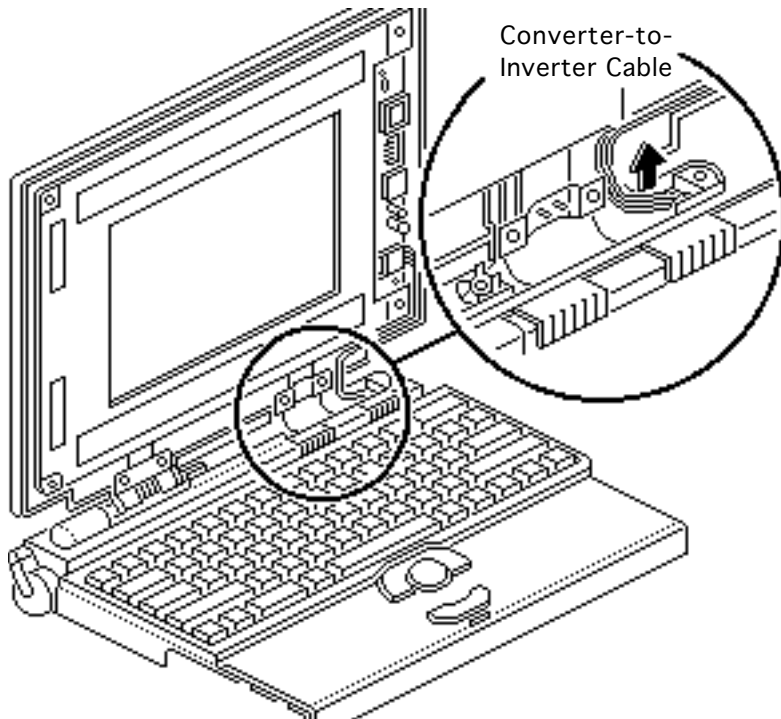




- 1 Pull off the center and right clutch covers.
- 2 Using a Torx driver, remove the three mounting screws from the right clutch.
- 3 Remove the clutch from the display housing.

Replacement Note: Replace the short mounting screw in the top-inside clutch threading. The top-outside threading is used to mount the bezel.

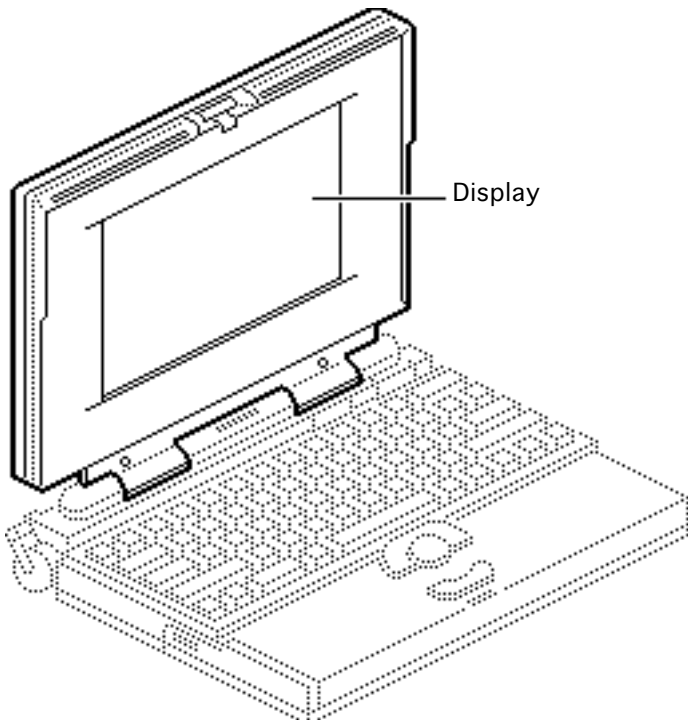




- 4 Remove the converter-to-inverter cable from the case.

Replacement Note: To avoid pinching the converter-to-inverter cable, route the cable around the bottom right corner of the display.





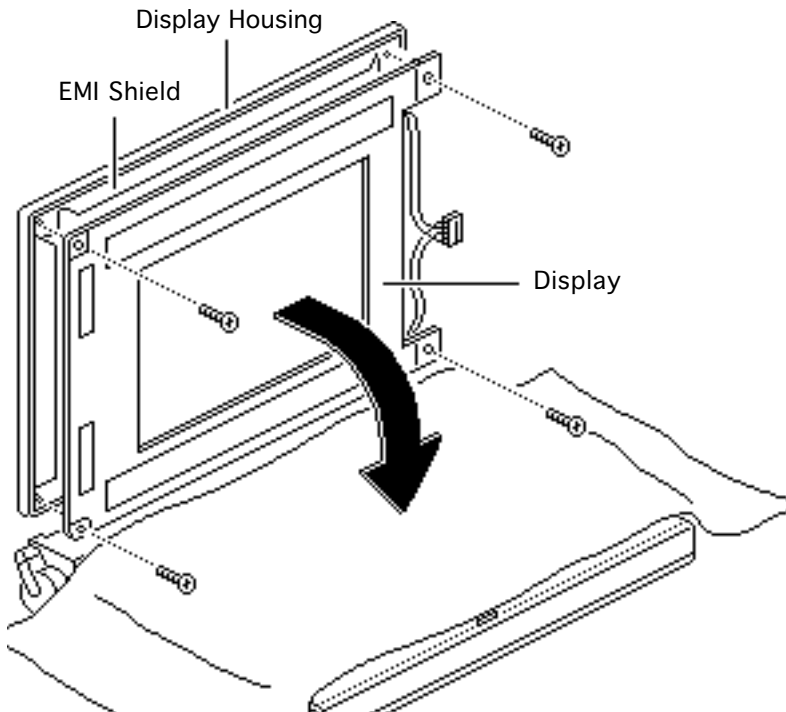
Display

Before you begin, remove the following:

- Main battery
- Display bezel
- DC/AC inverter

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.





PowerBook 180c Display (CPRC/Intl. Only)

Note: The PowerBook 180c active-matrix display module is available to CPRC and international repairers only.

Caution: The display cable is fragile and should be handled with care.

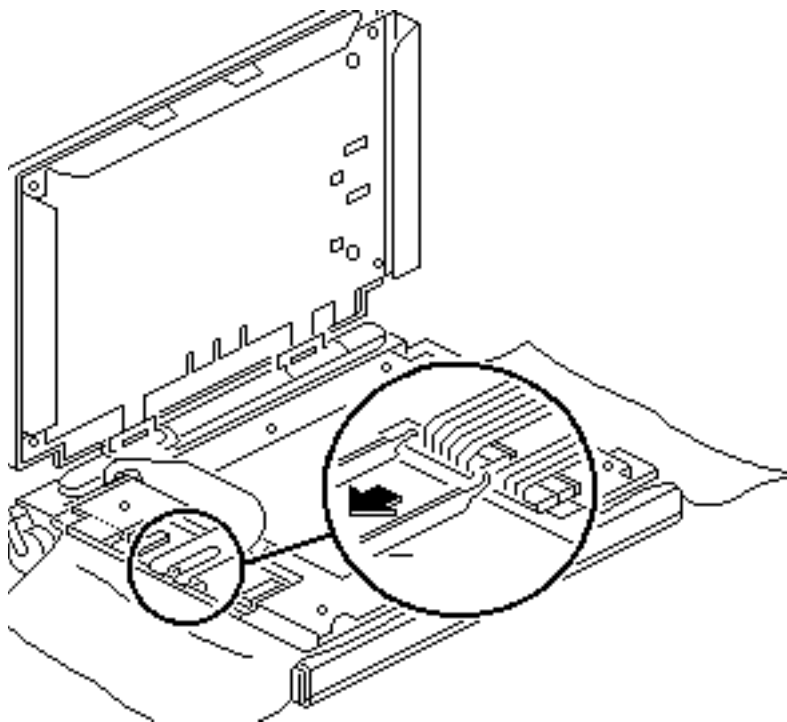
- 1 Cover the keyboard with a clean cloth or sheet of paper.





- 2 Using a T-8 Torx driver, remove the four display mounting screws.
- 3 Remove the display from the housing and EMI shield.
- 4 Place the display face-down on the keyboard.





PowerBook 180c (All Service Providers)

- 1 Using an IC extractor, disconnect the display cable from the two connectors.
- 2 **Caution:** The display cable is attached to the display with adhesive near the base of the display. Carefully pry up the cable at this point.

Gently detach the display cable from the





back of the display.

3 Remove the display.

Replacement Note: Before returning the defective display to Apple, be sure to transfer the protective plastic from the replacement display to the defective display.

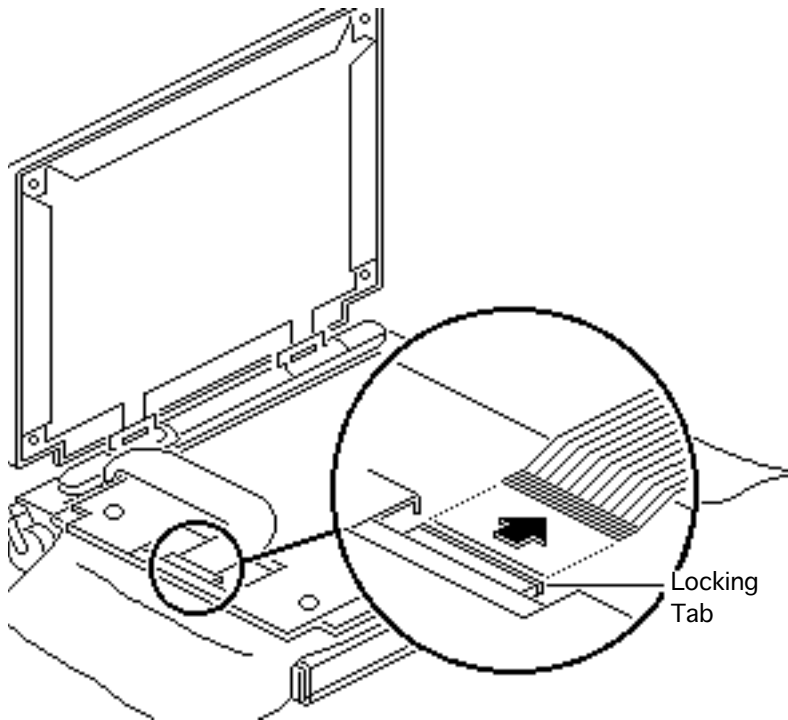




PowerBook 165c

- 1 Lift the locking tab on the display connector and disconnect the display cable.
- 2 **Caution:** The display cable is attached to the display with adhesive near the connector and interconnect ends of the cable. Carefully pry the cable off the display at these two points.

Gently detach the display cable from the back of the display.





3 Remove the display.

Replacement Note: Before returning the defective display to Apple, be sure to transfer the protective plastic from the replacement display to the defective display.

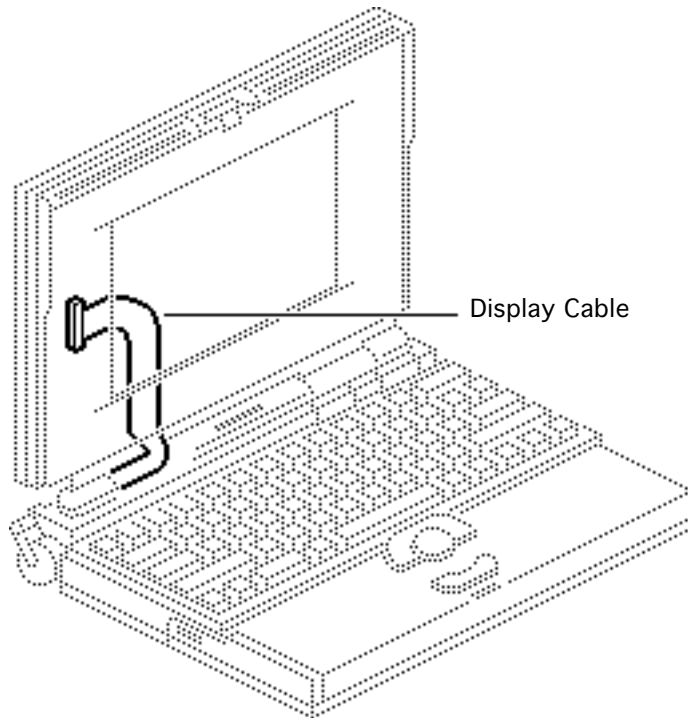




Display Cable

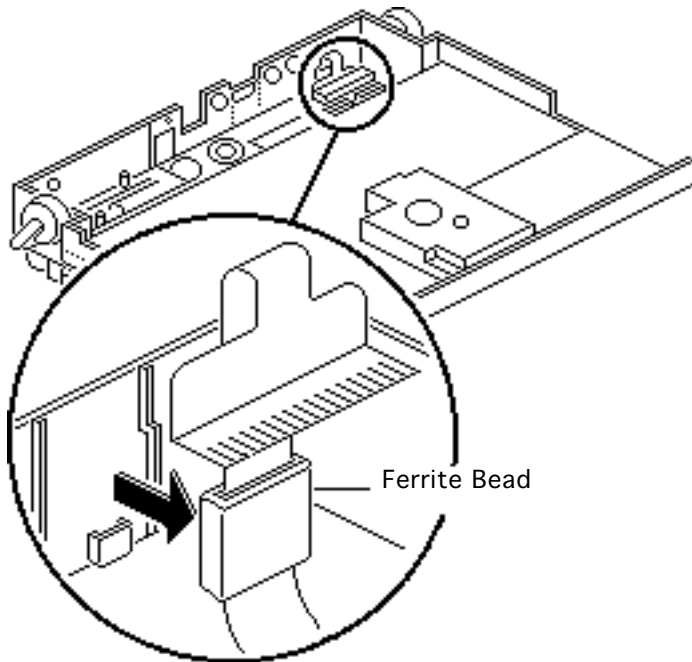
Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- DC/DC converter
- Interconnect board
- Display bezel
- DC/AC inverter
- Display



Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage.





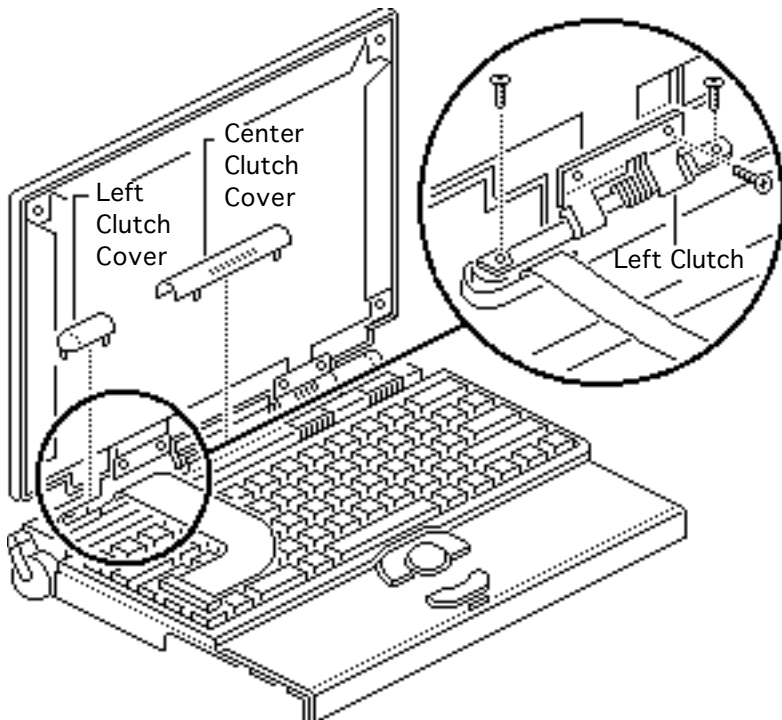
Review the ESD precautions in Bulletins/Safety.

Note: The PowerBook 180c display cable has two connectors on the end.

Caution: The display cable is fragile and should be handled with care.

- 1 Pry the display cable ferrite bead from the case.





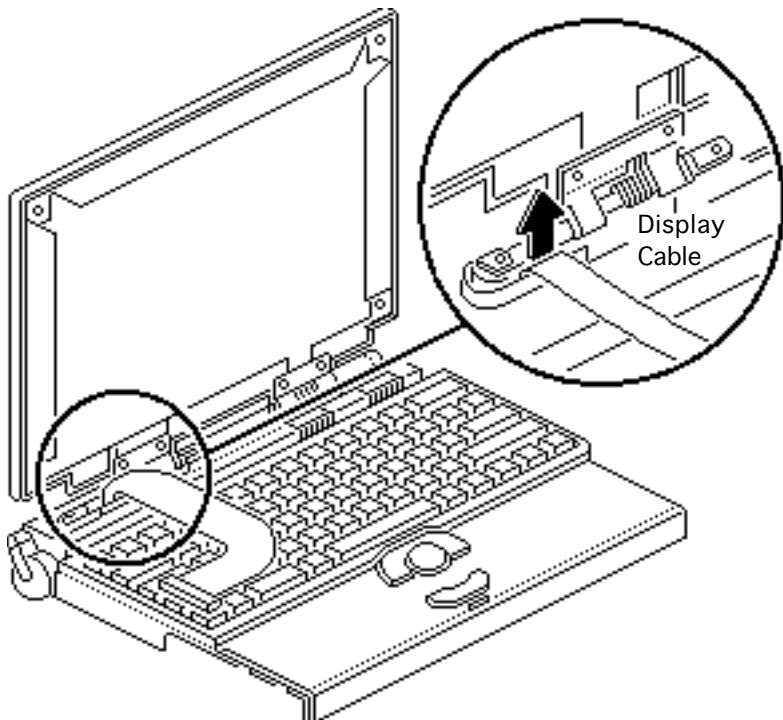
- 2 Pull off the center and left clutch covers.
- 3 Using a T-8 Torx driver, remove the three mounting screws from the left clutch.
- 4 Remove the clutch from the display housing.

Replacement Note: Replace the short mounting screw in the top-inside clutch threading. The top-outside threading is used to mount the bezel.





- 5 Remove the display cable from the case.

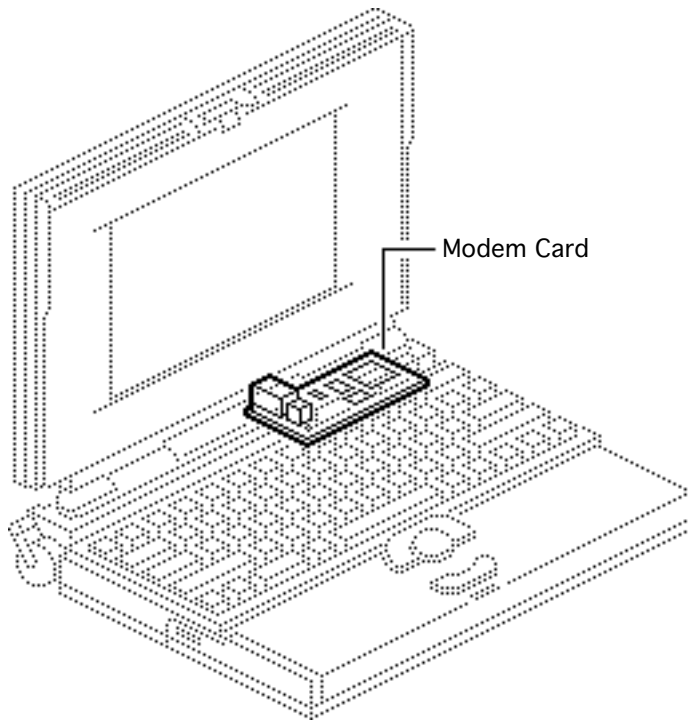




Upgrades

PowerBook 165c, 180c





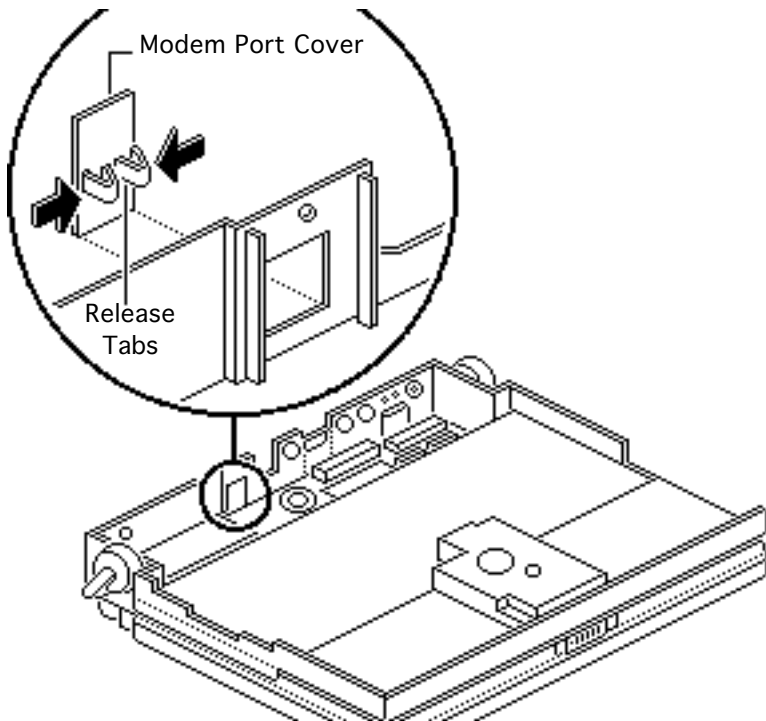
Modem Card

Before you begin, remove the following:

- Main battery
- I/O door
- Top case

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



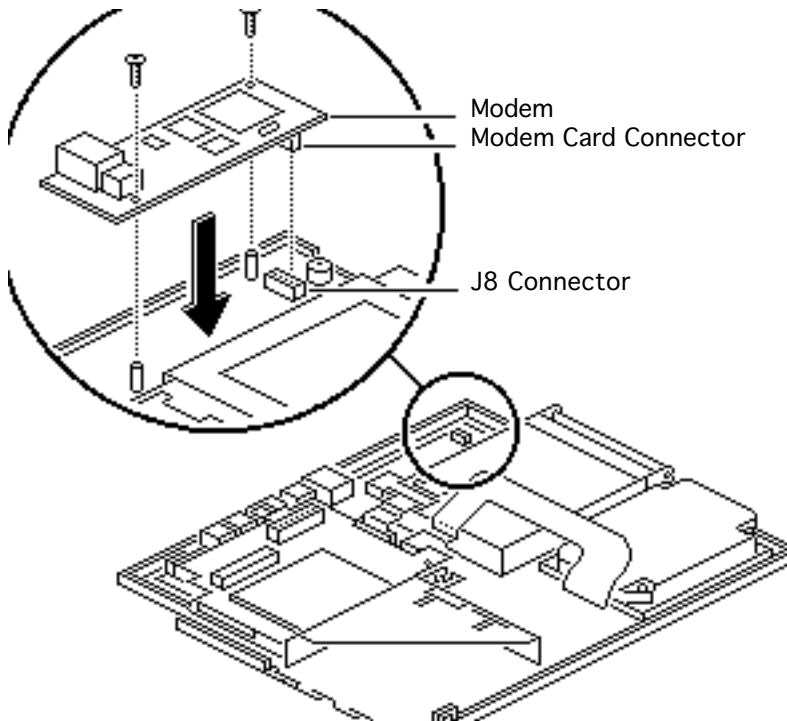


Caution: If you install a third-party modem card, make sure that it does not cover any of the heat sinks on the daughterboard or over the floppy drive.

Note: The modem card is an option for the PowerBook 165c/180c.

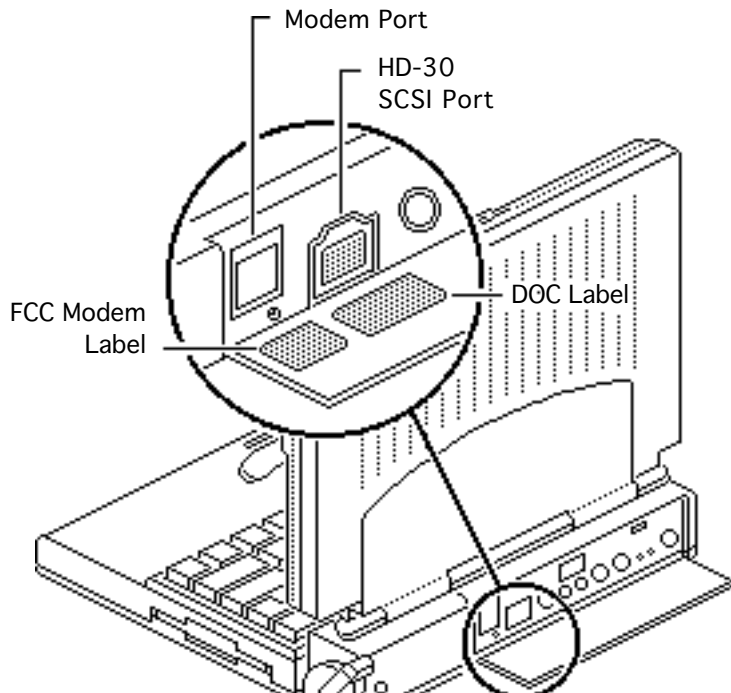
- 1 Pinch the release tabs and push out the modem port cover.





- 2 Connect the modem card connector to motherboard connector J8.
- 3 Install the two mounting screws.





- 4 Affix the FCC modem label to the inside of the I/O door. Align the label with the modem port.
- 5 Affix the DOC label to the inside of the I/O door. Align the label with the HD-30 SCSI port.



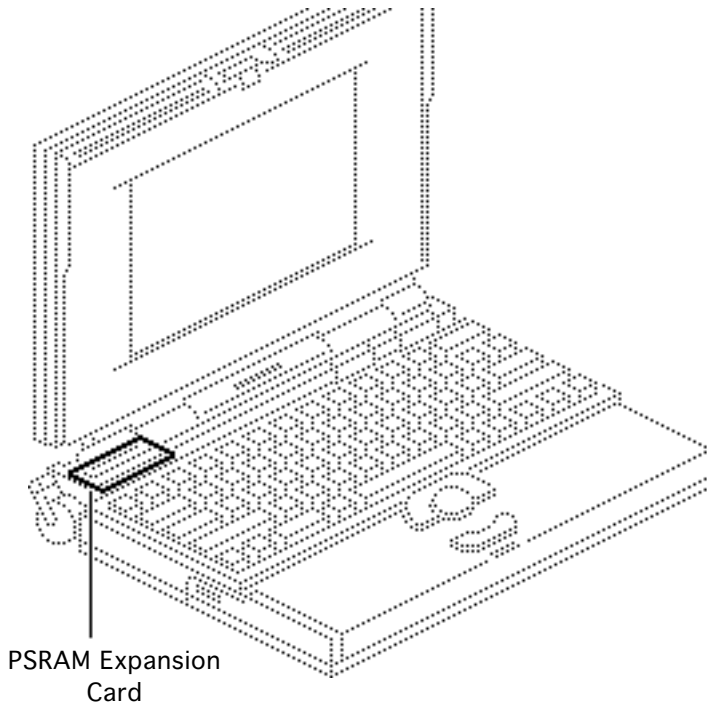


PSRAM Expansion Card

Before you begin, remove the following:

- Main battery
- I/O door
- Top case

Caution: The PowerBook 165c/180c contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



PSRAM Expansion
Card





Caution: Handle the PSRAM card by the edges only. Do not touch any components on the card.

Caution: If you install a third-party expansion card, do not remove or cover up any of the heat sinks on the daughterboard. Operating the computer without the heat sinks significantly increases the chance of daughterboard failure.

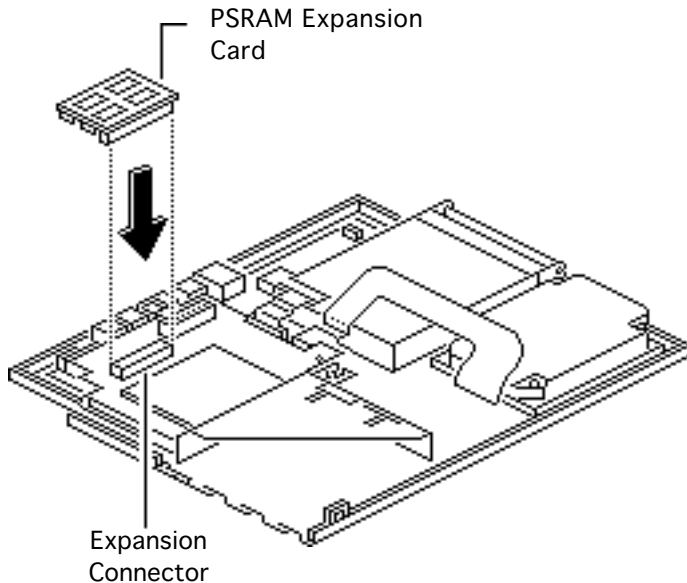




Caution: An incorrectly installed PSRAM card could damage the daughterboard. Note that the expansion connector and the PSRAM card are keyed for proper installation. Do not force the card into the connector, thereby defeating the key.

Caution: When installing the card, press down on the edge directly above the connector. Be careful not to apply pressure to any components or you may permanently damage the card.





Connect the PSRAM expansion card to the expansion connector on the daughterboard.

Note: To verify that the upgrade is successful, check the Total Memory message (for systems with virtual memory switched off) or the Built-in Memory message (for systems with virtual memory switched on). The memory size should be 4 MB of soldered RAM plus the RAM on the expansion card. If the memory size is incorrect, replace the





expansion card. If the memory size is still incorrect, send the computer to Apple.

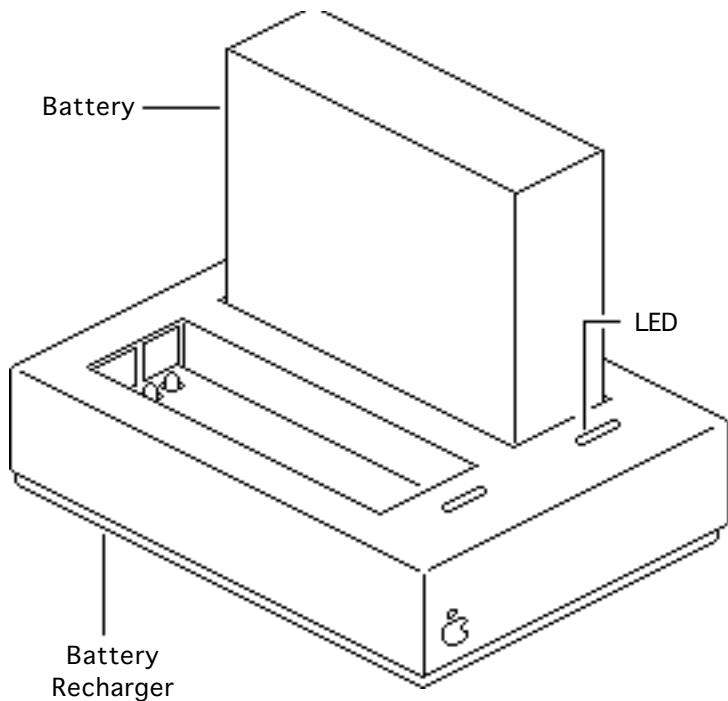




Additional Procedures

PowerBook 165c, 180c





Battery Recharger

No preliminary steps are required before you begin this procedure.

- 1 Using the PowerBook power adapter, plug the battery recharger into a power outlet and insert the main battery into the recharger.





- 2 Track the status of the battery. If the LED is
 - Yellow, the battery is charging
 - Green, the battery is ready to use
 - Off, the charger is unplugged, the battery is bad, the power adapter is defective, or the charger is defective.

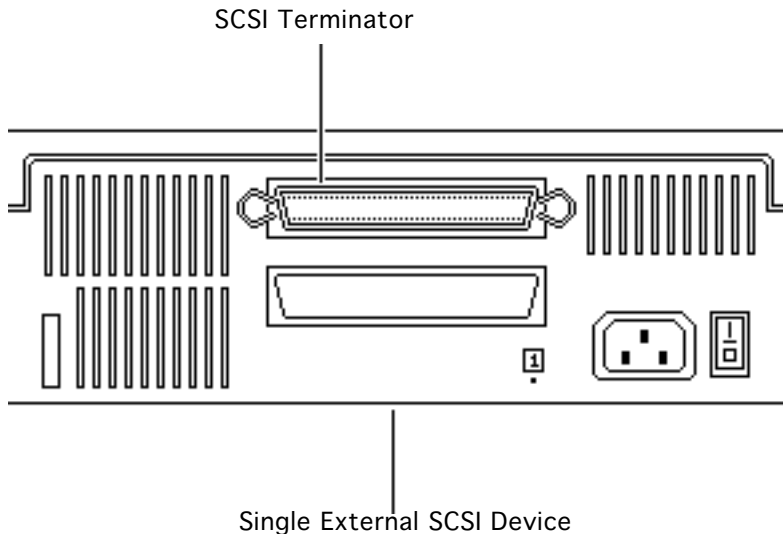




SCSI Termination

No preliminary steps are required before you begin this procedure.

- 1 **Note:** The PowerBook 165c/180c does not provide SCSI termination at the logic board; remember to terminate at the beginning and end of the SCSI chain. Use the standard Apple terminator.





- 2 When terminating SCSI devices, follow these guidelines:
 - Add one terminator to a single external SCSI device, or
 - Add one terminator to the first device and another to the last when there are multiple devices.

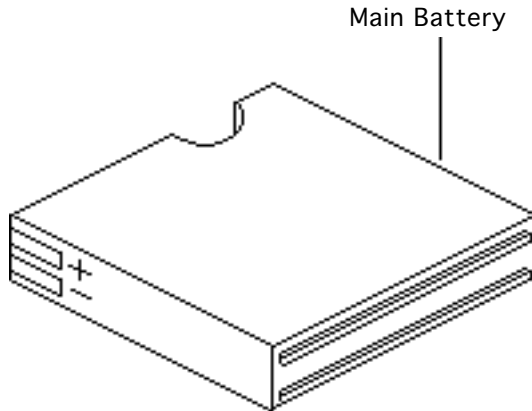


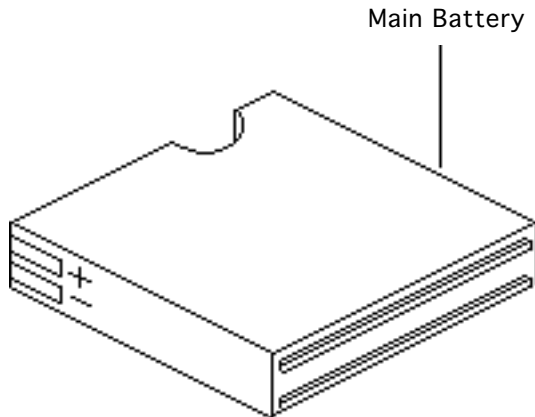


Battery Handling

No preliminary steps are required before you begin this procedure.

⚠ Warning: The main battery contains toxic materials. Review battery handling and disposal instructions in Bulletins/ Safety.

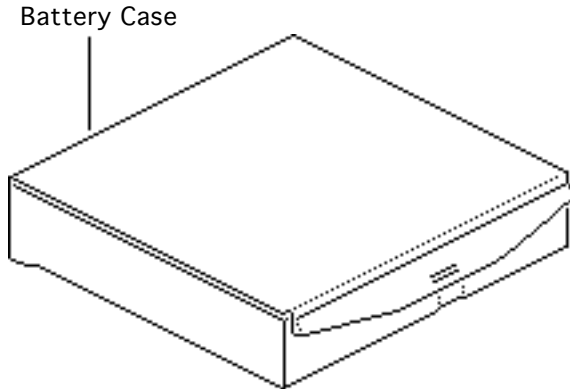




Follow these guidelines for properly handling the battery:

- Handle the battery carefully. Do not drop, puncture, disassemble, mutilate, or incinerate the battery.
- Fully charge a replacement battery before using it; Apple ships batteries in a partially charged state.
- Do not leave the battery in the computer for longer than two weeks without plugging in the power adaptor.





- Completely discharge and then recharge the battery once a month.
- Store the battery in the protective battery case.
- Do not short-circuit the battery terminals.
- Keep the battery in a cool, dark place; do not store it for longer than 6 months without recharging.



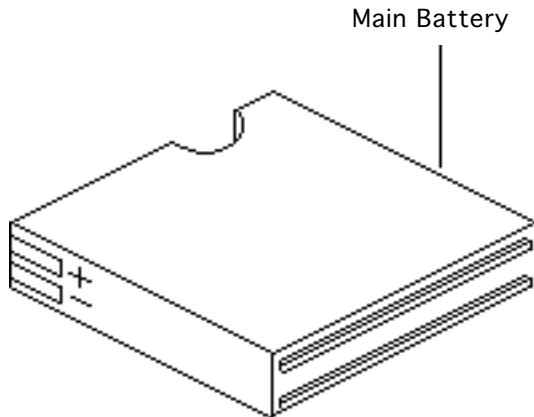


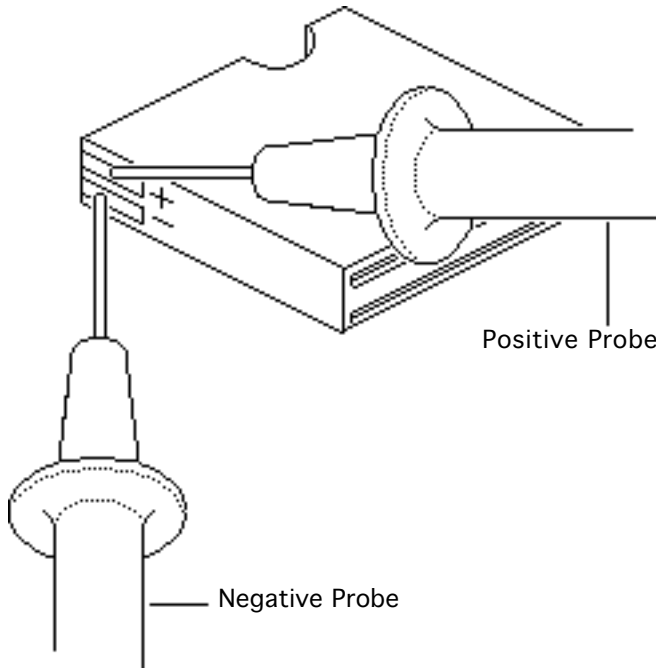
Battery Verification

Before you begin, remove the main battery.

Note: The battery desk accessory is a general indicator of the battery charge. Use a voltmeter to determine the actual charge. Refer to the following procedure.

Warning: The main battery contains toxic materials. Review battery handling and disposal

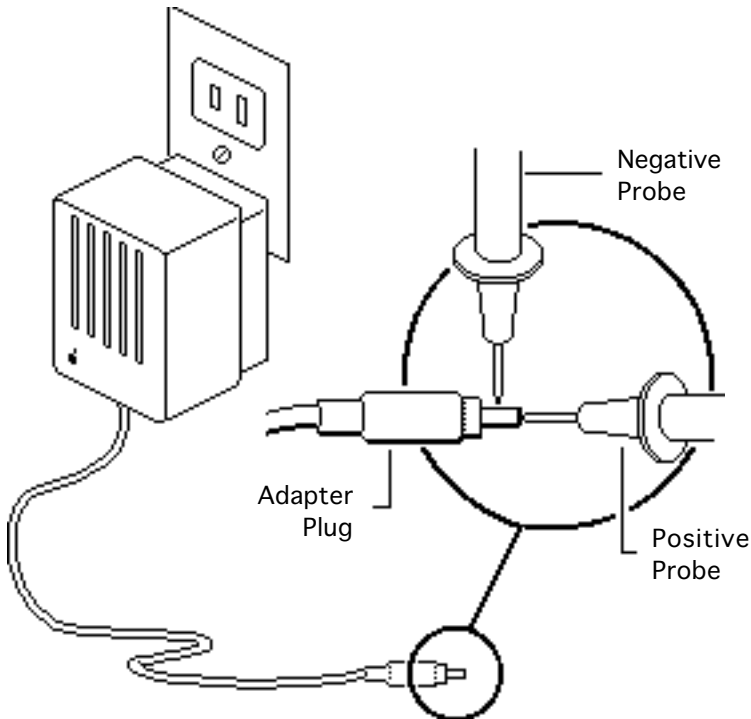




instructions in Bulletins/
Safety.

- 1 Set a voltmeter to the 10 volts DC scale.
- 2 Hold the positive probe of the voltmeter to the positive battery terminal and the negative probe to the negative terminal.
- 3 If the reading is not above 5.7 volts, recharge (first) or replace the battery.





AC Adapter Verification

No preliminary steps are required before you begin this procedure.

- 1 Plug the AC adapter into a wall socket.
- 2 Set a voltmeter to the 10 volts DC scale.
- 3 Hold the positive probe of the voltmeter to the inside of the AC adapter plug and the negative probe to the outside of the plug.





- 4 If the reading is not 7.5-7.9 volts, replace the adapter.

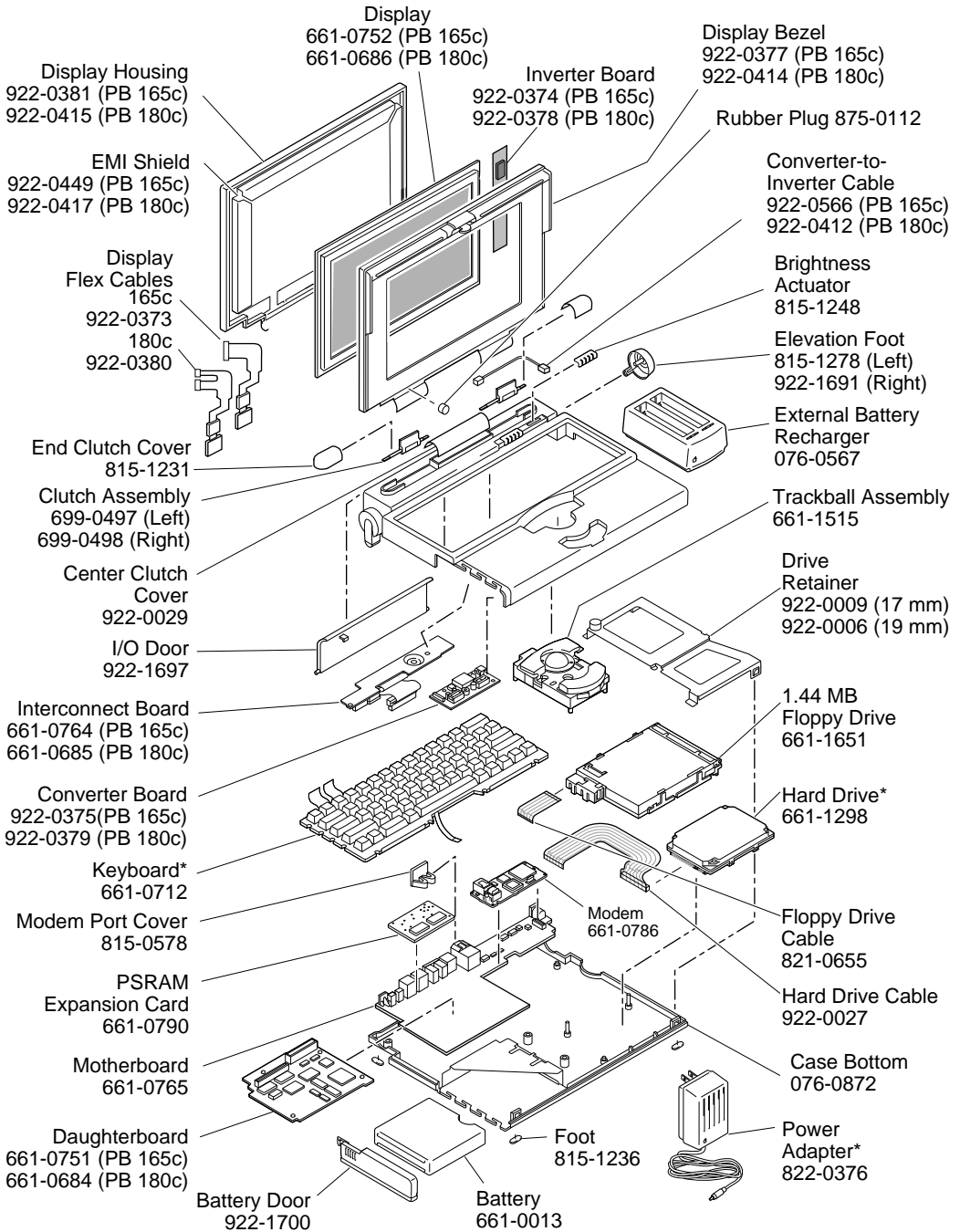




Exploded View

PowerBook 165c, 180c





Product family configurations may vary. For parts with asterisk (*), refer to parts list.
PowerBook 165c and 180c

