PowerBook 160/165/180 Series

PowerBook 160, PowerBook 165,
PowerBook 180

Basics

PowerBook 160/165/180

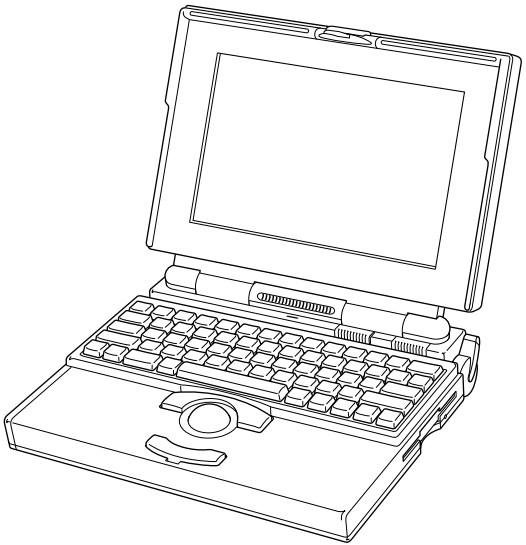


Figure: PowerBook 160, 165, 180

Overview

This manual includes complete repair procedures for the PowerBook 160, PowerBook 165, and PowerBook 180..

Display Compatibility Matrix

	Active Matrix PB 180 661-0748	FSTN, Rev. A PB 160/165 661-0745
Inverter	922-0024	922-0025
Display Cable	630-6273	922-0820
Inverter Cable	936-0106	936-0106

Important: PowerBook 160/165/180 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 160/165/180

Processor

160 CPU	Motorola 68030 microprocessor 25 MHz
165 CPU	Motorola 68030 microprocessor 33 MHz
180 CPU	Motorola 68030 microprocessor 33 MHz
Coprocessor (180 Only)	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) installed on the daughterboard Expandable to 8 MB with 4 MB expansion card Expandable to 14 MB with third-party PSRAM expansion cards
ROM	1 MB
PRAM	256 bytes of parameter memory
VRAM	128K of static video display memory
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. hard drives (many capacities)

I/O Interfaces

Floppy Drive	DB-19 serial port for connecting external floppy drives
SCSI	HDI-30 SCSI port with 1.5 MB/sec. transfer rate Supports up to five external SCSI devices Does not provide termination power Connect SCSI device to computer with HDI-30 SCSI system cable.
Apple Desktop Bus	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
Sound	Monaural sound-in port Stereo sound-out headphone jack, which plays CD audio tracks in stereo and computer-generated sounds in mono
Video	Video-out port; 8 bit, 256 color video support Supports Macintosh monitors up to 16-in. color and VGA monitors
Power Adapter	Power adapter port
Security	Slot for third-party security equipment
Modem	Slot for optional internal modem

I/O Devices

Keyboard

Built-in keyboard with standard Macintosh layout
63 keys domestic; 64 keys ISO
Two-level tilt adjustment

Trackball

30 mm diameter, dual button
ADB interface

Microphone

Electret, omnidirectional
Output voltage of 4 mV, peak to peak

Sound and Video

Sound Generator	Apple sound chip provides 8-bit sound capable of driving stereo headphones or other stereo equipment through the sound jack 8-bit sound input, sampled at 11 or 22 kHz
160/165 Video Display	10 in. (254 mm) diagonal screen Flat-panel, film-compensated supertwist nematic (FSTN) liquid crystal display CCFL on-demand backlight 16 shades of gray; 640 by 400 pixels
180 Video Display	10 in. (254 mm) diagonal screen Flat-panel, active-matrix liquid crystal display CCFL on-demand backlight 16 shades of gray; 640 by 400 pixels

Electrical

Main Battery	Nickel cadmium (NiCad), 2.5 Ah Provides 2-3 hours of usage before recharging Recharge time: 3 hours 500 power cycles capacity
PRAM Battery	3 V lithium
Power Adapter	110–220 VAC line voltage 17 W, 50–60 Hz US, Japanese, United Kingdom, Australian, and European versions

Physical

Dimensions	Height: 2.25 in. (5.7 cm) Width: 11.25 in. (28.6 cm) Depth: 9.3 in. (23.6 cm)
Weight	6.8 lb. (3.1 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
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/receive at 9600 baud
300-14,400 bps data transmission rates
2400/4800/7200/9600 bps transmission rates
Full duplex operation; asynchronous or framed modes
Error correction: V.42 compliance (MNP 2-4)
Data compression: V.42bis (4 to 1 compression) and MNP-5 (2 to 1 compression)
Requires 300K of system RAM

SCSI Adapter

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

Troubleshooting

PowerBook 160/165/180

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 160/165/180

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

If this does not reset the power manager,

5 Remove the AC adapter and the battery.

6 Let the unit sit without power hooked up for 3–5 minutes.

7 Using two paper clips, simultaneously hold down the reset and interrupt buttons for 5–10 seconds.

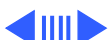
8 Reinstall the battery and, if necessary, reconnect the AC adapter.

9 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

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.

Power

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

Low-power warning appears	1 Recharge battery or attach power adapter. 2 Verify that peripherals are low-power. 3 Remove external devices or connect power adapter. 4 Try known-good, charged main battery. 5 Try known-good power adapter. 6 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.

Video

Pixel is always white	PowerBook 180 If there are more than five voids (pixels that are always white), or two or more voids within one inch of each other, replace display (CPRC/international repairers only) or return computer to Apple. PowerBooks 160 and 165 Replace display.
Pixel is always black	PowerBook 180 Replace display (CPRC/international repairers only) or return computer to Apple. PowerBooks 160 and 165 Replace display.

Video

Row or partial row of pixels never comes on (white line)

PowerBook 160/165

1 Check cables.
2 Replace display cable.
3 Replace display. If PowerBook has serial number below FC247xxxxxx or CK247xxxxxx, replace both display and daughterboard. (Do not replace Rev. B daughterboard.)
4 Replace interconnect board.

PowerBook 180

5 Check cables.
6 Replace display cable.
7 Replace display (CPRC/international repairers only) and install System Enabler, v. 1.01.
8 Replace interconnect board.
9 Return computer to Apple.

Video

Row or partial row of pixels is always on (black line)

PowerBook 160/165

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

PowerBook 180

5 Check cables.
6 Replace display cable.
7 Replace interconnect board.
8 Replace display (CPRC/international only) or return computer to Apple.

Video

Thin white line is always on at middle of screen	PowerBook160/165 Thin white line is normal. PowerBook 180 Replace display (CPRC/international repairers only) or return computer to Apple.

Video

Display is very light or totally white	1 Adjust screen contrast. 2 Check display cable, inverter board, interconnect board, daughterboard, and motherboard connections. 3 Replace inverter board. 4 Replace interconnect board. 5 Replace display cable. 6 PowerBook 160/165: Replace display. 7 Replace daughterboard. 8 Replace motherboard. 9 PowerBook 180: Replace display (CPRC/international repairers only) or return computer to Apple.

Video

Rainbow colors visible from extreme viewing angles	PowerBook 160/165 Such colors are normal for FSTN screens.
Screen brightness is not uniform	PowerBook 160/165 Irregularity in screen brightness is normal. Adjust contrast and brightness to diminish effect. PowerBook 180: Replace display (CPRC/international repairers only) or return computer to Apple.

Video

Display stopped working or dimmed but is fine now	PowerBook 160/165 If temperature is in the approximate range of under 5 or over 40 degrees centigrade, this reaction is normal.

Video

Backlight doesn't operate	1 Verify that cables are not pinched or severed. 2 Check display cable, inverter board, interconnect board, daughterboard, and motherboard connections. 3 Replace inverter board. 4 Replace inverter display cable. 5 Replace interconnect board. 6 Replace display cable. 7 PowerBook 160/165: Replace display. 8 Replace daughterboard. 9 Replace motherboard. 10 PowerBook 180: Replace display (CPRC/international repairers only) or return computer to Apple.

Video

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

No display, but computer appears to operate correctly	1 Adjust screen contrast. 2 Check display cable, inverter board, interconnect board, daughterboard, and motherboard connections. 3 Connect power adapter. 4 Replace inverter board. 5 Replace interconnect board. 6 Replace display cable. 7 PowerBook 160/165: Replace display. 8 Replace daughterboard. 9 Replace motherboard. 10 PowerBook 180: Replace display (CPRC/international repairers only) or return computer to Apple.

Video

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.

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.

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 Mac 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

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

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.

Peripherals

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.
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.

Peripherals

1 Replace interconnect board.
2 Replace daughterboard.
3 Replace motherboard.

Cursor intermittently does not move or moves erratically

1 Restart computer.
2 Clean ball and rollers of trackball.
3 Check cables.
4 Replace trackball.
5 Replace keyboard.
6 Replace interconnect board.
7 Replace motherboard.

Peripherals

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.

Peripherals

No response to any key on keyboard	1 Reset power manager. 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.

Peripherals

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. Refer to Networks manual. 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.

Peripherals

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 reseat 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 reseat modem card. 4 Verify that System is 7.1 or later. 5 Replace modem card.

Internal Modem

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 reseat 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 reseat modem card. 2 Replace modem board. 3 Replace interconnect card. 4 Replace motherboard.

Internal Modem

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

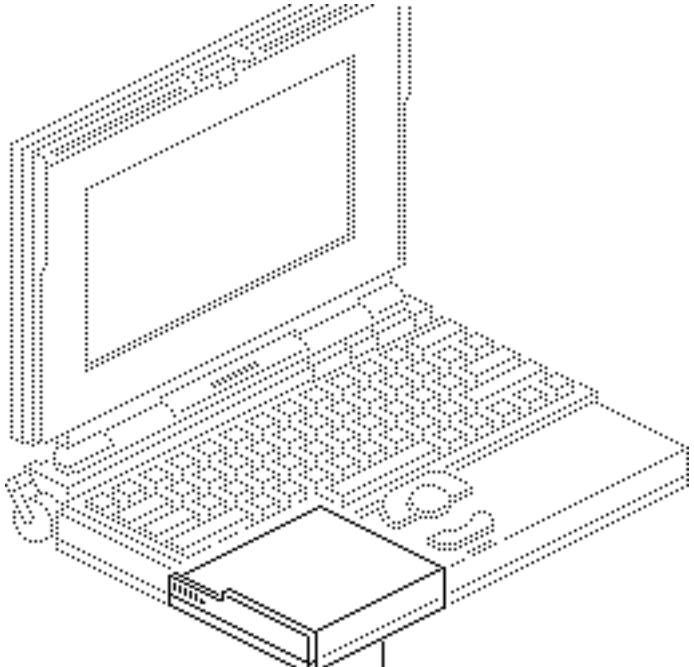
Screen goes blank and computer shuts down every few minutes	Adjust sleep delays in Control Panel or connect power adapter.
Application seems to run slower after few seconds	1 Disable System Rest. (See owner's manual.) 2 Connect power adapter.
Hard drive is slow to respond, or screen goes blank too often	Adjust sleep delays in Control Panel or connect power adapter.

Miscellaneous

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 160/165/180

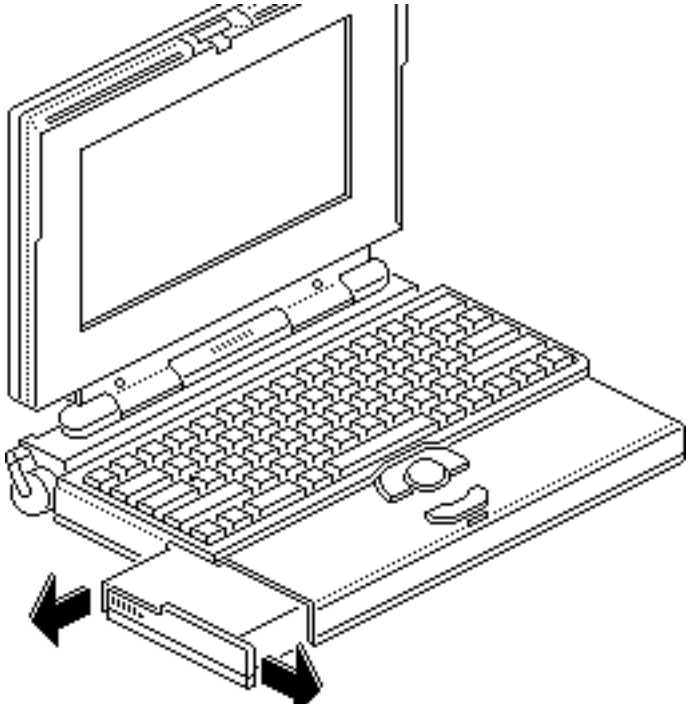


Main Battery

Before you begin, disconnect the power adapter.

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

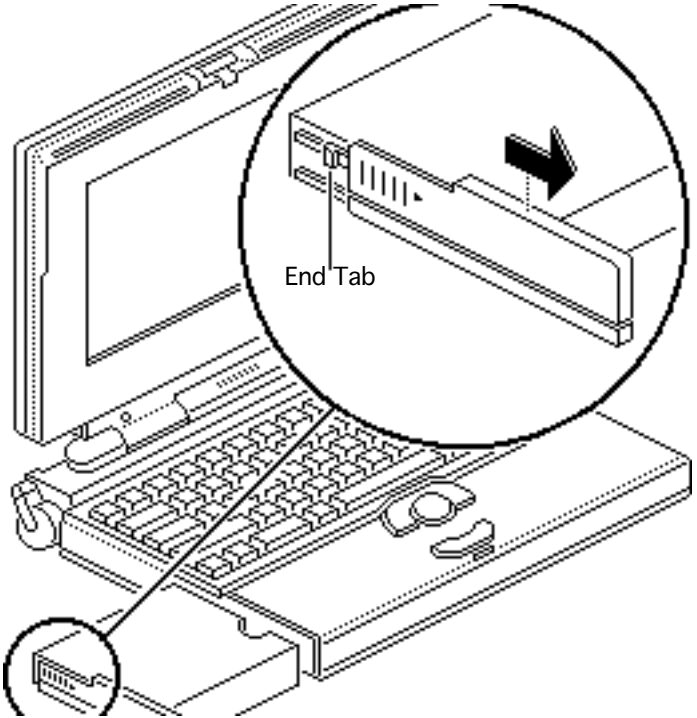
Important: Before removing the main battery, use the Macintosh Shut Down command. Otherwise, all RAM contents will be lost.



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

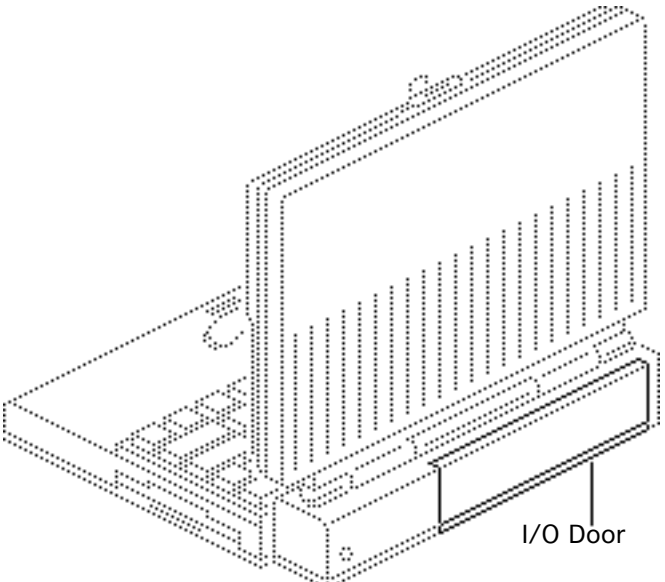
1 Slide open the battery door.

2 Using the battery door as a handle, pull out the main battery.



3 Slide the battery door completely open.

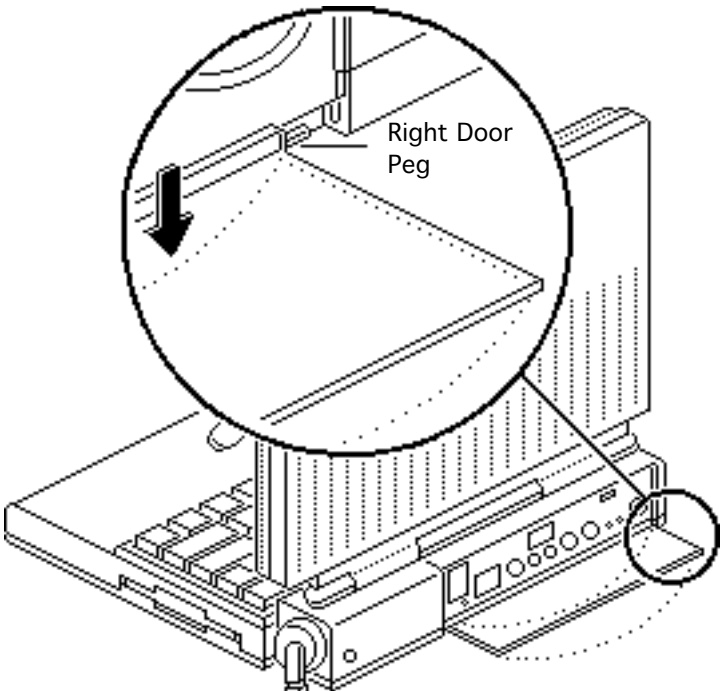
4 Pull the end tab until it releases and remove the door from the battery.



I/O Door

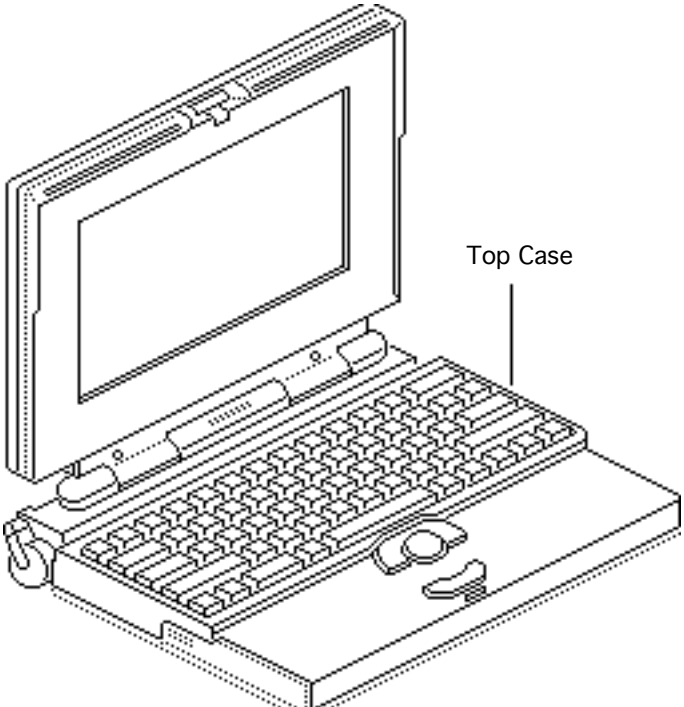
No preliminary steps are required before you begin this procedure.

Caution: The PowerBook 160/165/180 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 unhinge the two bottom door pegs.



Top Case

Before you begin, remove the following:

- Main battery
- I/O door

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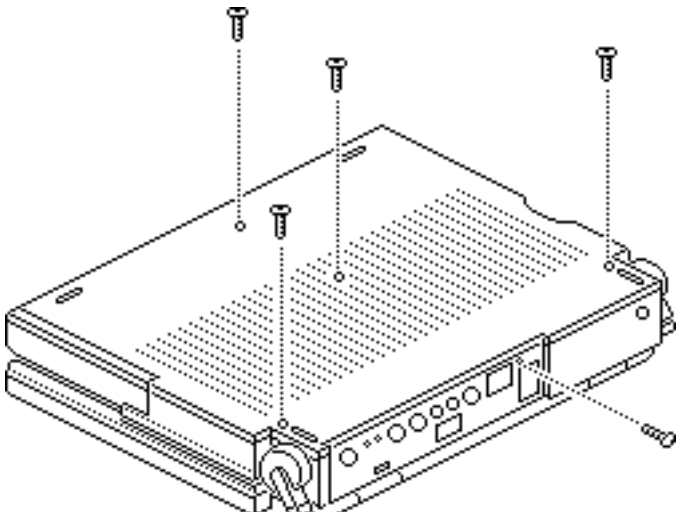
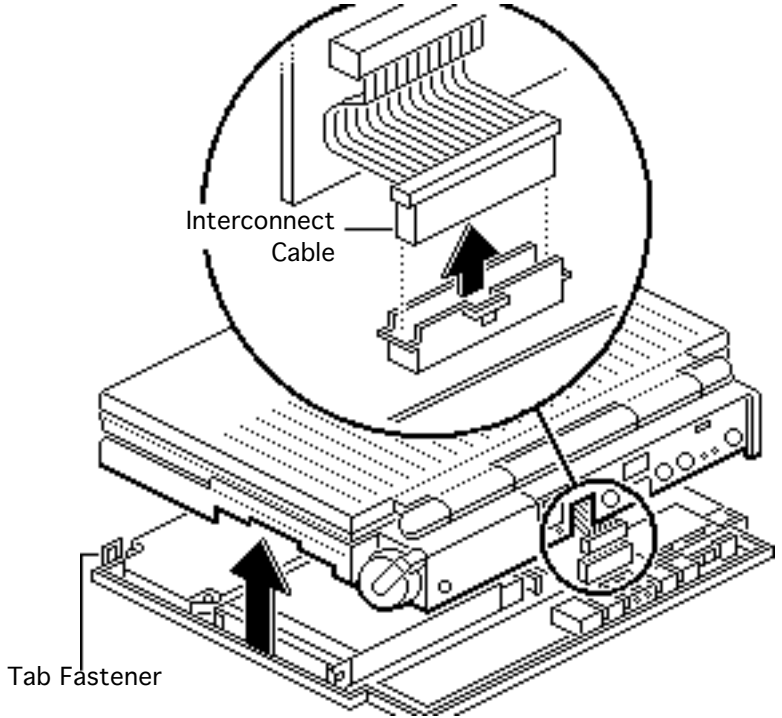


Note: Use a T-8 torx driver to remove the small screw from the rear connector panel and a T-10 torx driver to remove the other case screws.

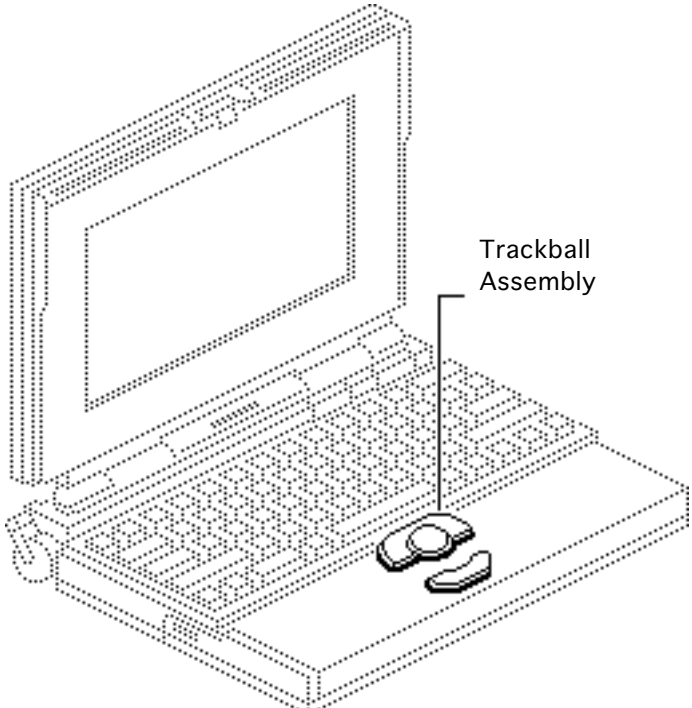
1 Remove the five torx screws from the bottom case.



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 display cable connector, fold the cable as shown. If it is not folded correctly, the cable could short.

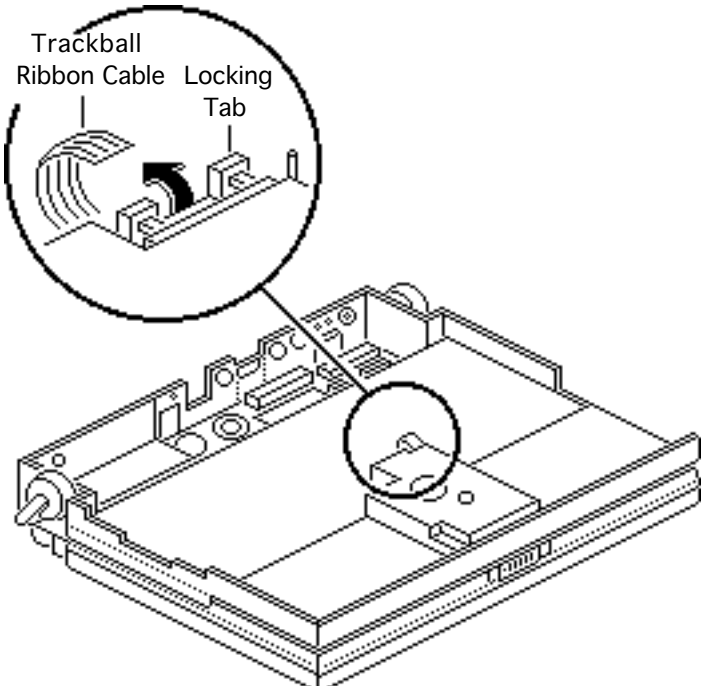


Trackball Assembly

Before you begin, remove the following:

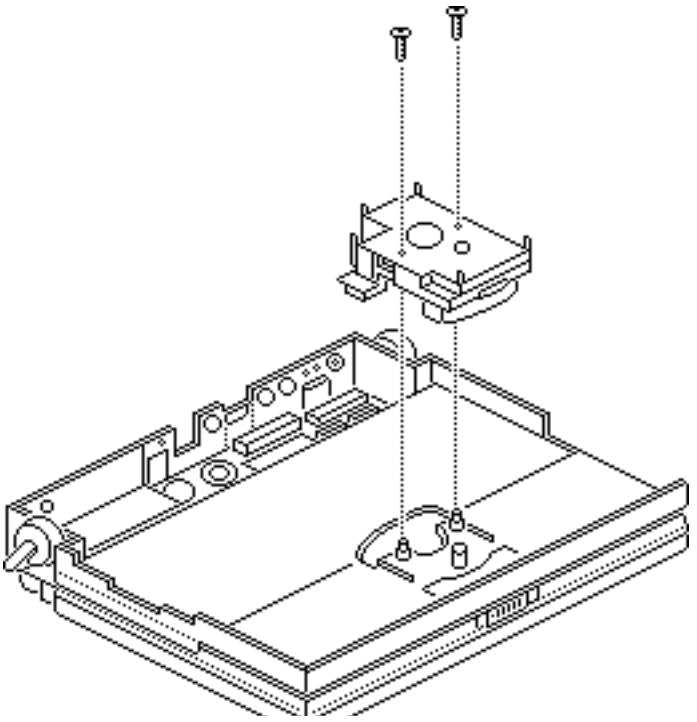
- Main battery
- I/O door
- Top case

Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

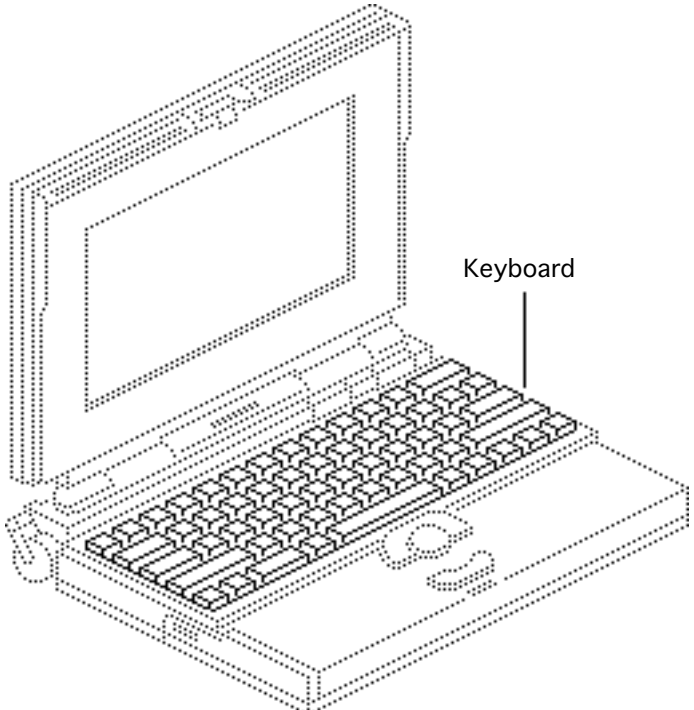


Caution: The trackball ribbon cable is fragile and should be handled with care.

1 Pull out the locking tab on the trackball connector and remove 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.

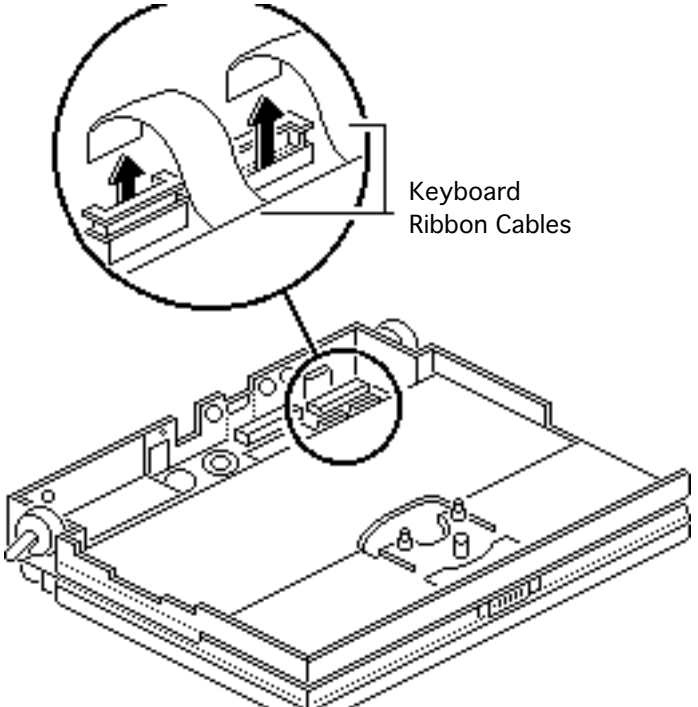


Keyboard

Before you begin, remove the following:

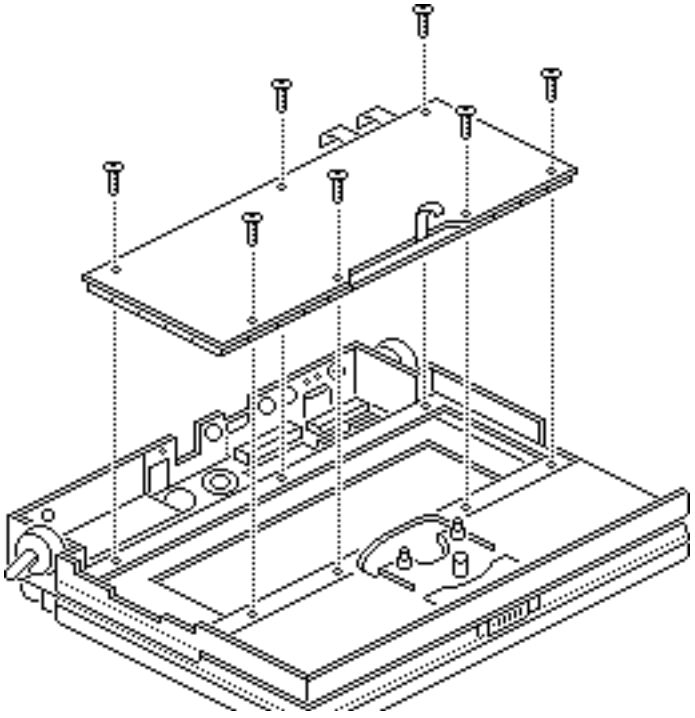
- Main battery
- I/O door
- Top case
- Trackball assembly

Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

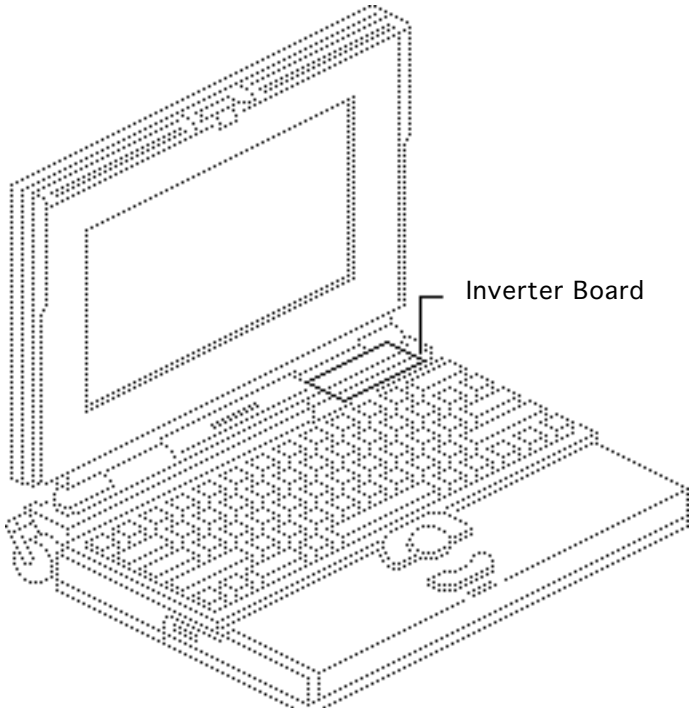


Caution: The keyboard ribbon cables are fragile and should be handled with care.

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



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



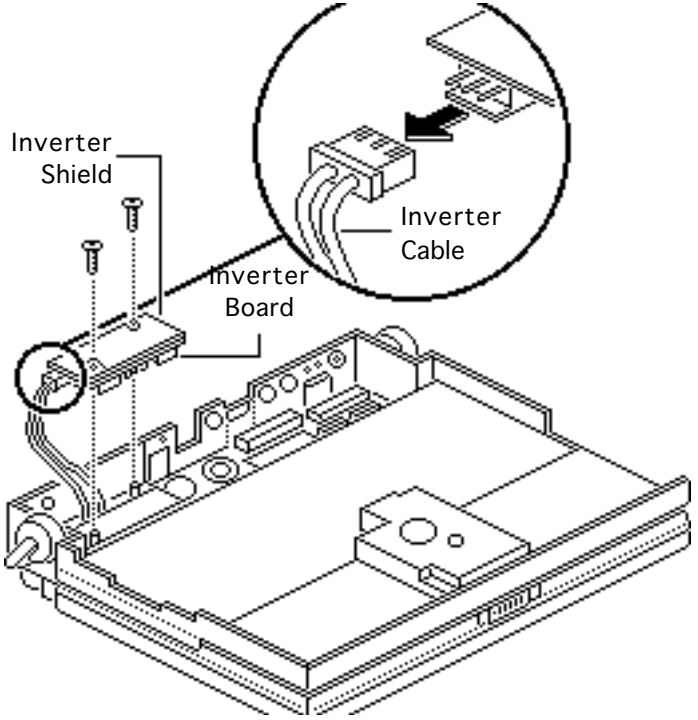
Inverter Board

Before you begin, remove the following:

- Main battery
- I/O door
- Top case

Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

Important: The PowerBook 160/165 and PowerBook 180 displays require different inverter boards. Refer to the Service Source parts database for the correct part number for each board.

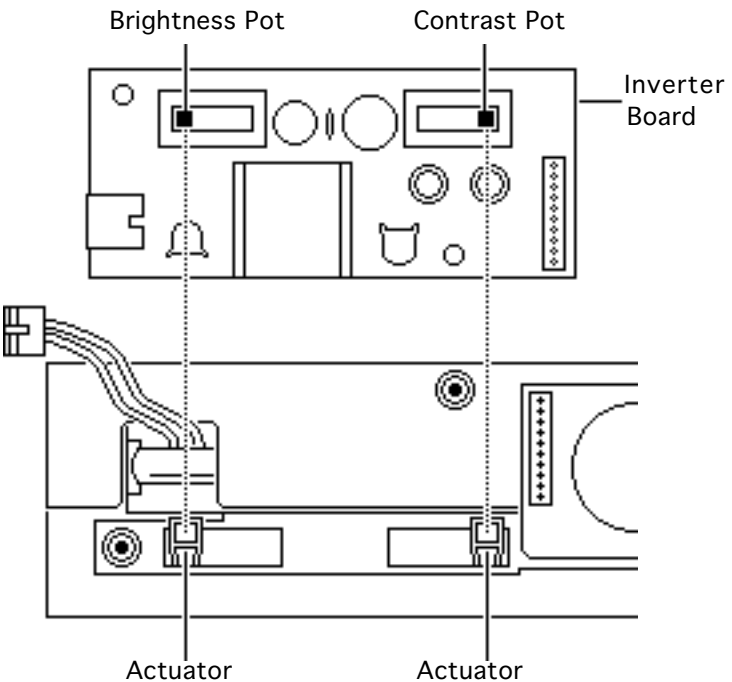


1 Remove the two mounting screws.

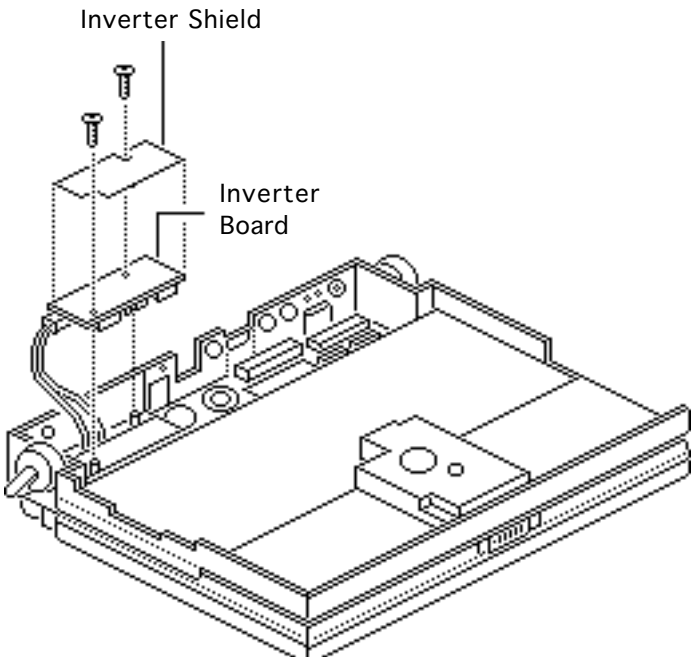
Note: Do not remove the inverter shield from the inverter board.

2 Pull the inverter board and attached shield straight up and off the connector on the interconnect board.

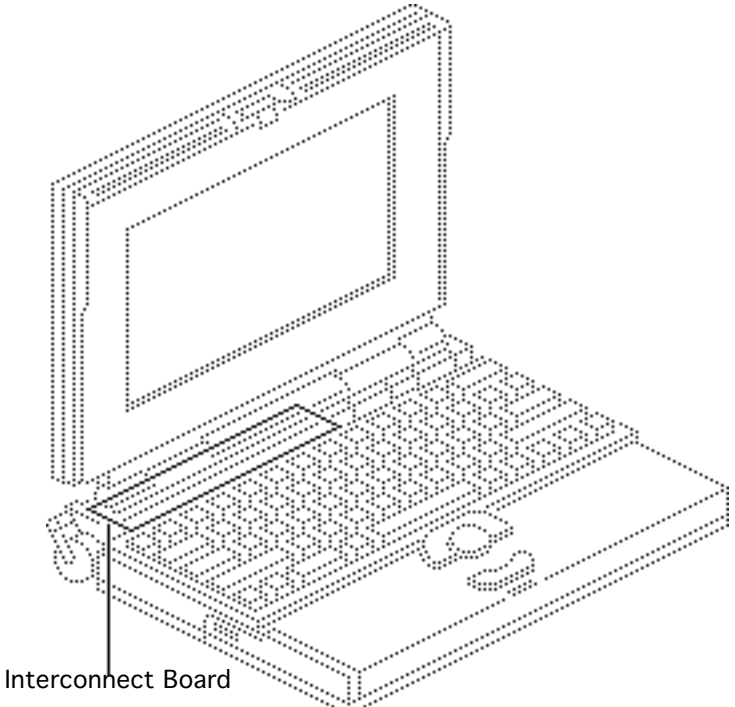
3 Disconnect the inverter cable.



Replacement Note: Be sure to align the brightness and contrast pots on the inverter board 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.



Replacement Note: If you are replacing the inverter board, order both the inverter board and the inverter shield. Install the new shield on the board before replacing it. Do not reuse the original inverter shield.

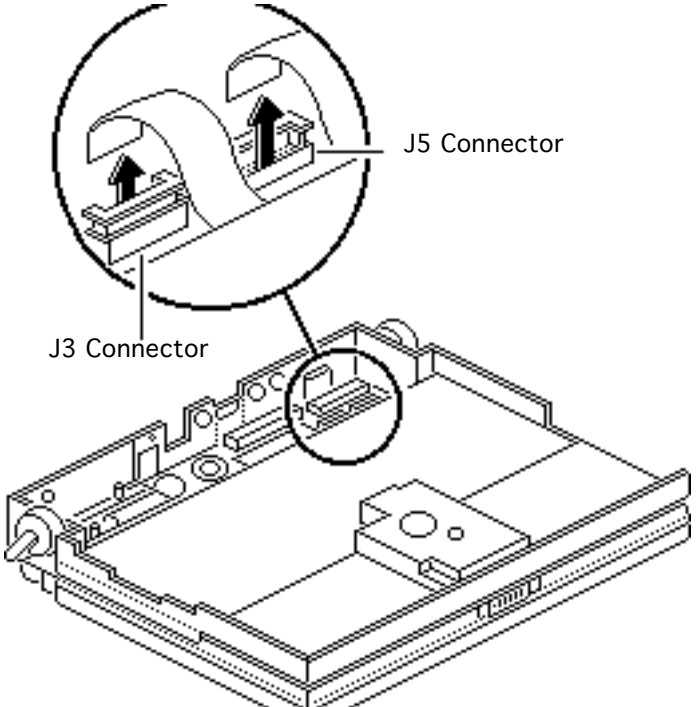


Interconnect Board

Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- Inverter board

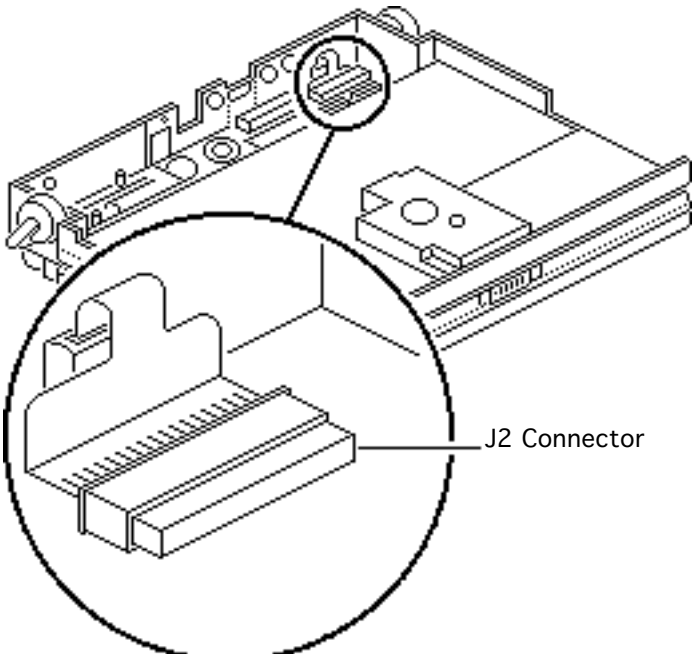
Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



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

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

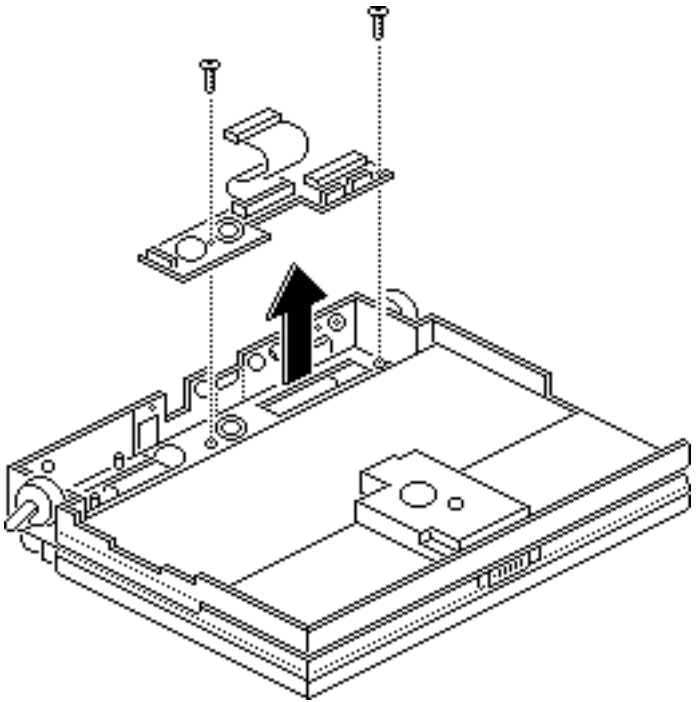
1 Lift the locking tabs on connectors J5 and J3 and remove the keyboard ribbon cables.



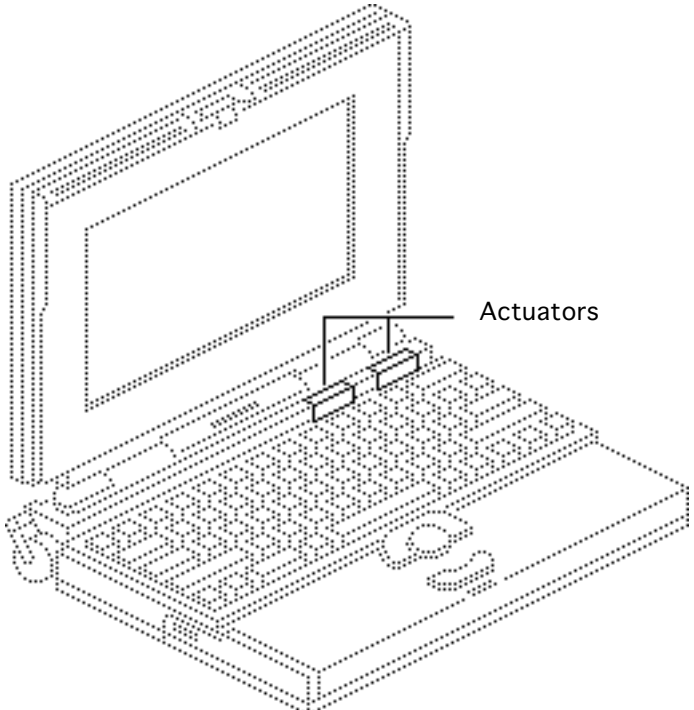
Note: The display cable will not come entirely out of the connector until you remove the interconnect board from the top case.

2 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.

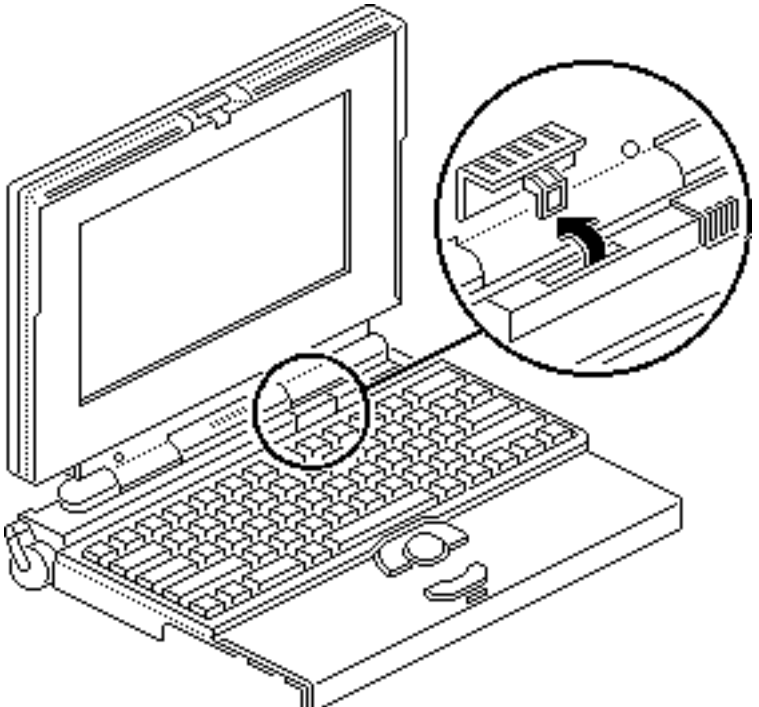


Actuators

Before you begin, remove the following:

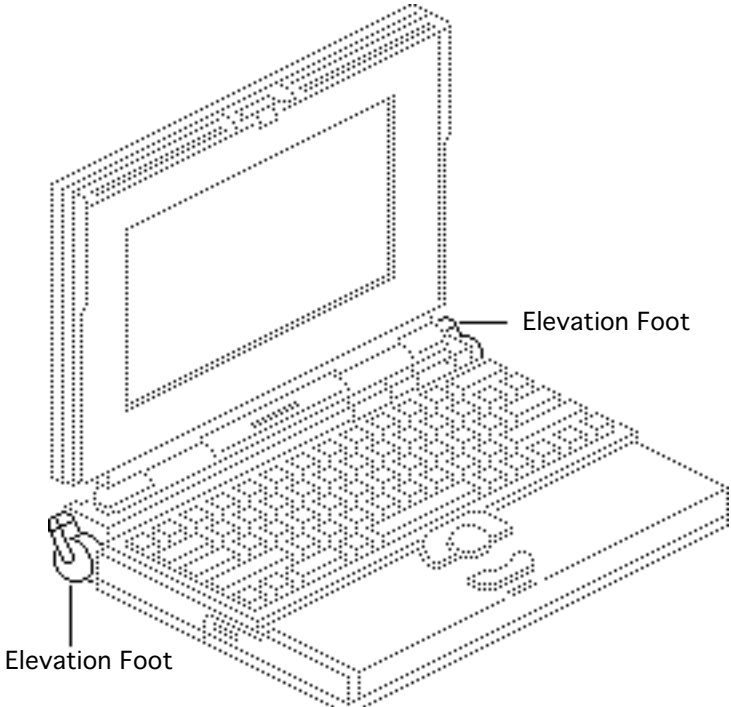
- Main battery
- I/O door
- Top case
- Inverter board

Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



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.

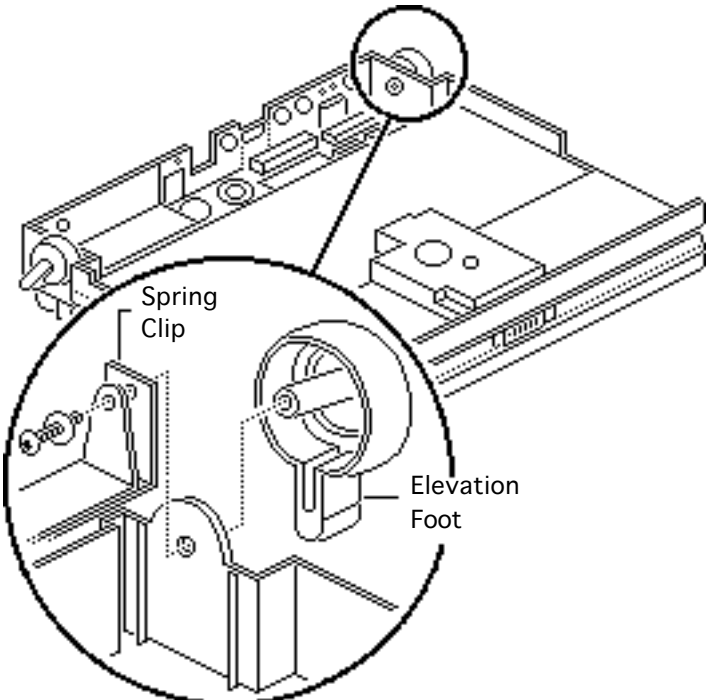


Elevation Feet

Before you begin, remove the following:

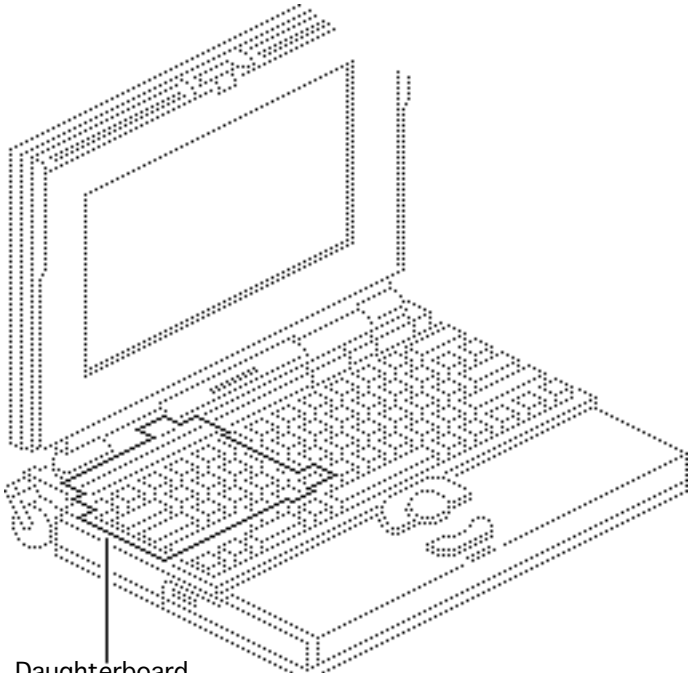
- Main battery
- I/O door
- Top case

Caution: The PowerBook 160/165/180 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.

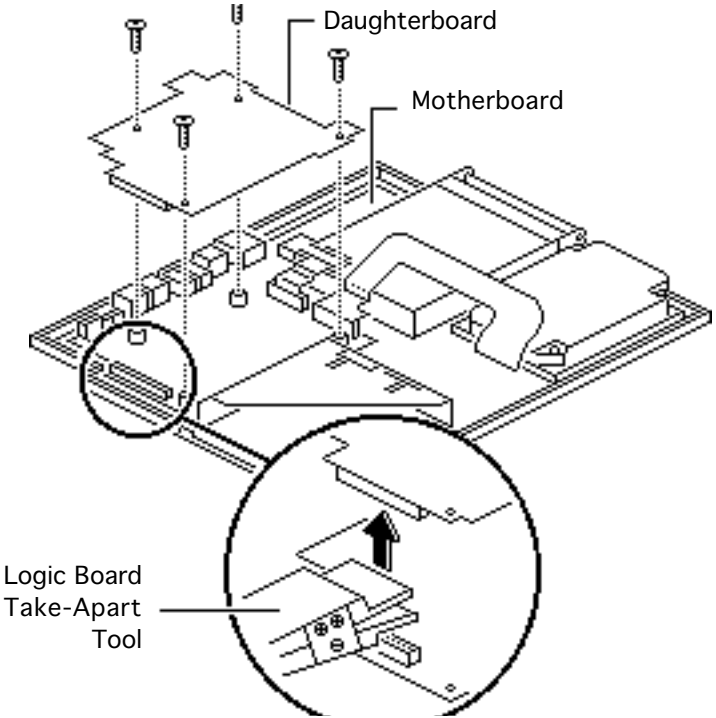


Daughterboard

Before you begin, remove the following:

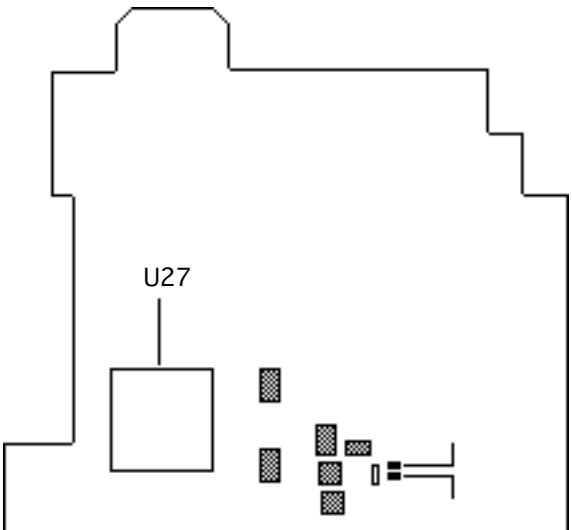
- Main battery
- I/O door
- Top case
- PSRAM expansion card (if present)

Caution: The PowerBook 160/165/180 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.

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.



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

Replacement Note: If you are replacing a defective daughterboard, be aware that the PowerBook 160/165/180 daughterboards are very similar. To differentiate daughterboards, check the underside of the board. PowerBook 180 daughterboards have an FPU chip soldered at location

U27; PowerBook 160/165 boards do not.

To further differentiate PowerBook 160 and 165 daughterboards, check the underside for the following resistors:

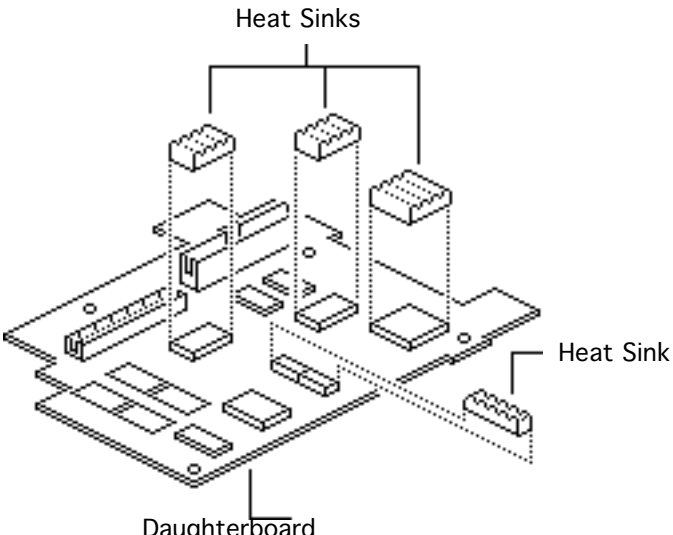
- PowerBook 160 daughterboard

  R38 resistor: installed

  R39 resistor: not installed
- PowerBook 165 daughterboard

  R38 resistor: not installed

R39 resistor: installed



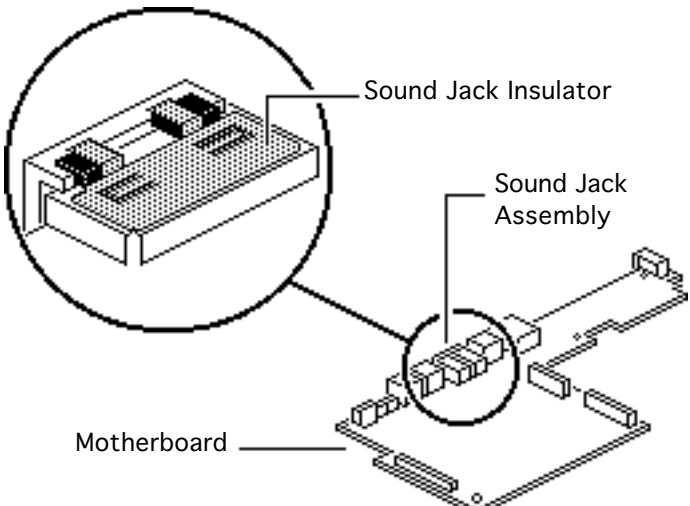
For daughterboard part numbers, refer to the Service Source parts database.

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.

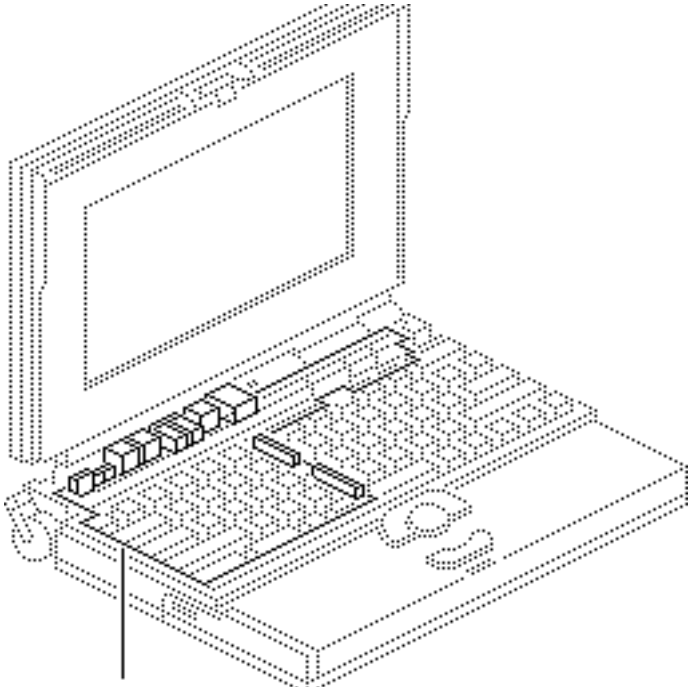
Replacement Caution: Make sure the heat sink is placed exactly as shown in the illustration. The heat sink should not hang over the side of the component it is covering, or it may short the component leads.



Replacement Note: If you are replacing a defective daughterboard in a PowerBook 160/180 within the serial number range FC233xxxxxx through FC241xxxxxx, you must also replace the sound jack insulator on the motherboard.

Replacement Note: To replace the sound jack insulator, carefully peel off the original insulator. Remove the paper backing on the revised insulator (part number 922-0591), and gently press it into place.

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

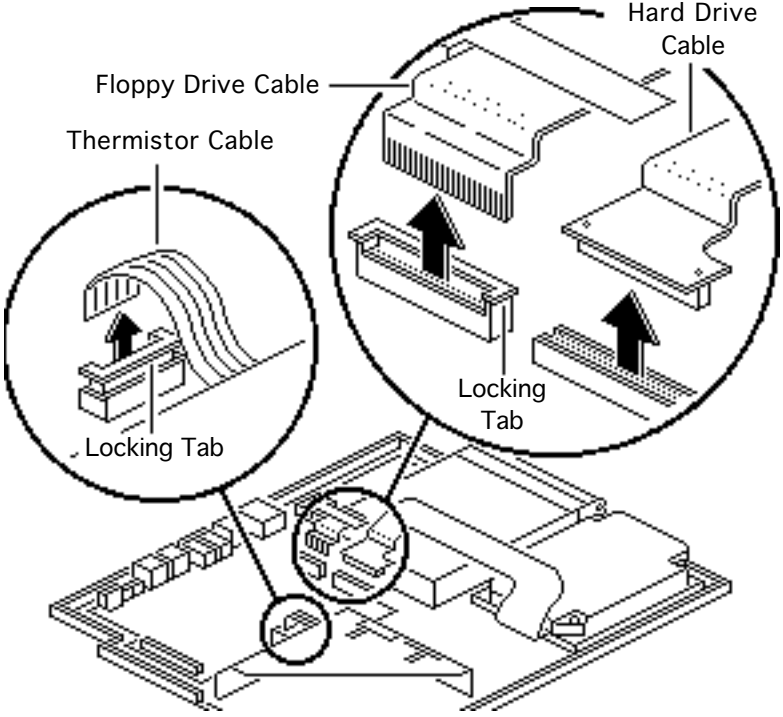


Motherboard

Before you begin, remove the following:

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

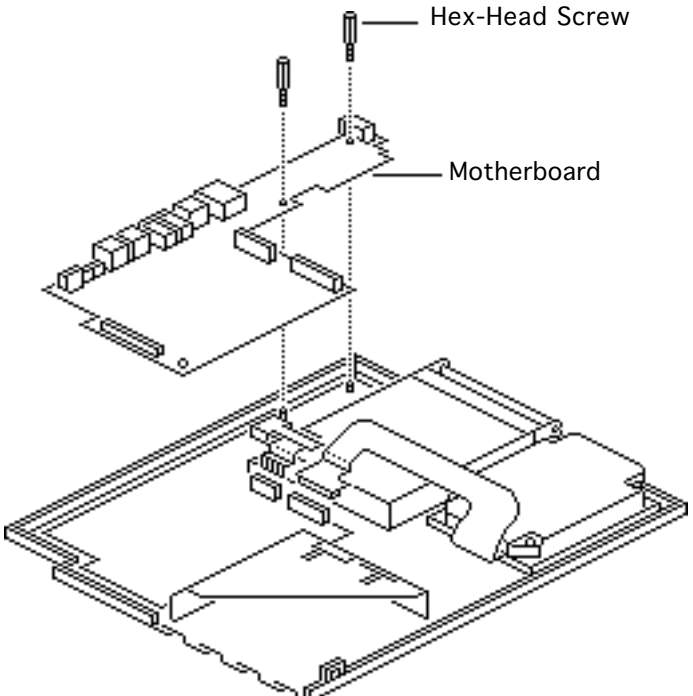
Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



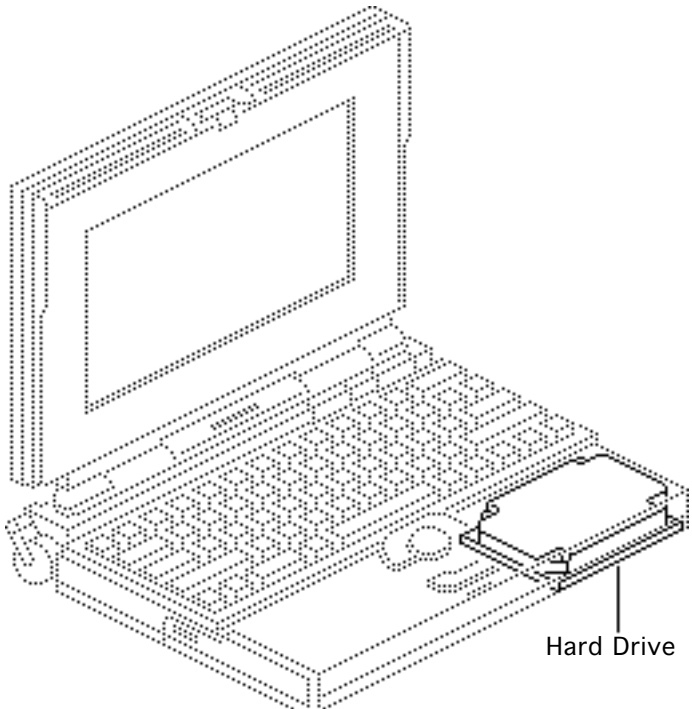
Caution: The hard drive, floppy drive, and thermistor cables are fragile and should be handled with care.

1 Lift the locking tabs and remove 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.

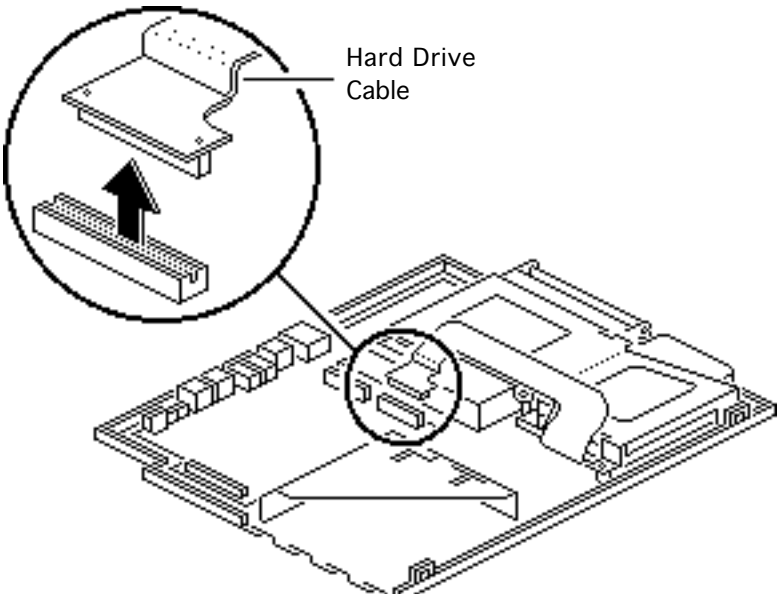


Hard Drive

Before you begin, remove the following:

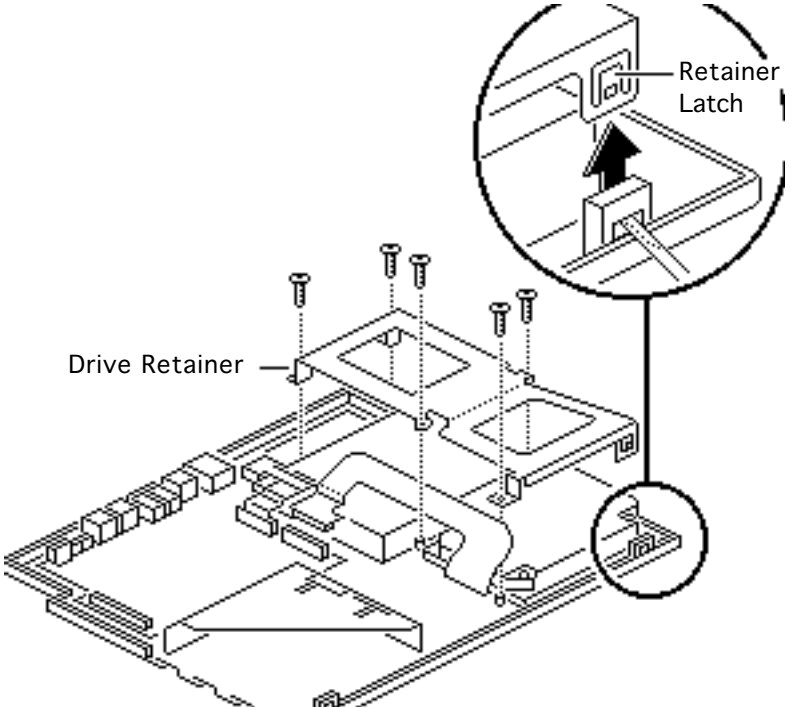
- Main battery
- I/O door
- Top case
- Modem card (if present)
- Daughterboard

Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



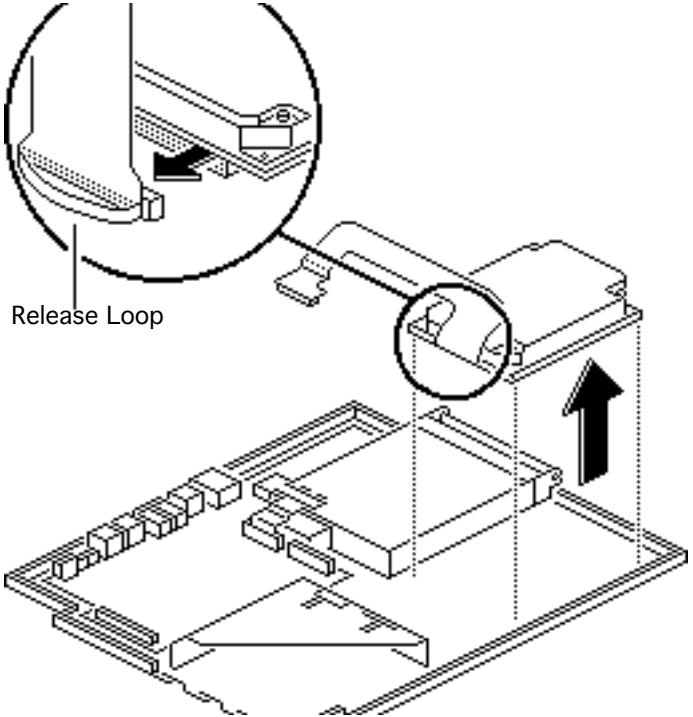
Caution: The hard drive cable is fragile and should be handled with care.

1 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.



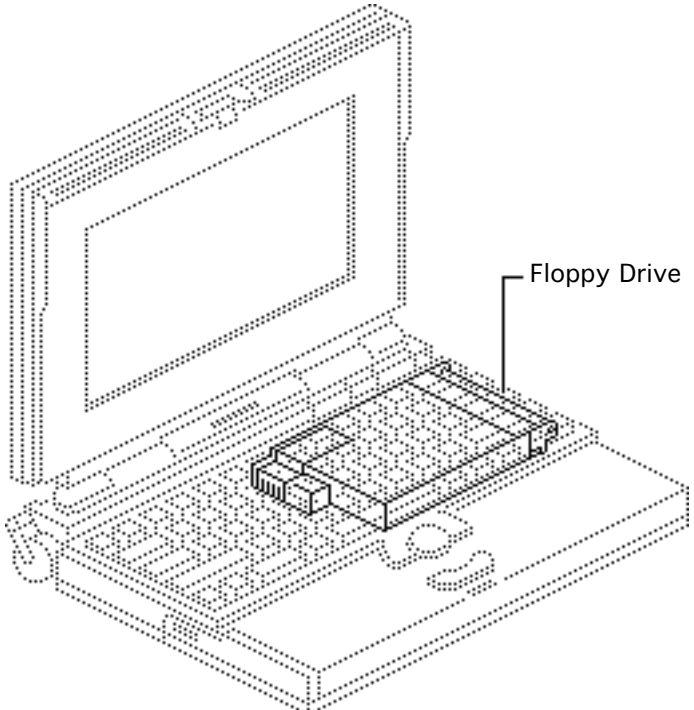
4 Lift the hard drive from the case.

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: Drive retainers for 17-mm-high and 19-mm-high hard drives are not interchangeable. Check the height of the replacement drive and use the appropriate drive retainer. If you are upgrading from a 40 MB to 80 MB hard drive, use the ridged, 17-mm retainer that shipped with the 80 MB hard drive.

Replacement Note: For information on returning drives, cables, and carriers to Apple, refer to Additional Procedures in the Hard Drives chapter.

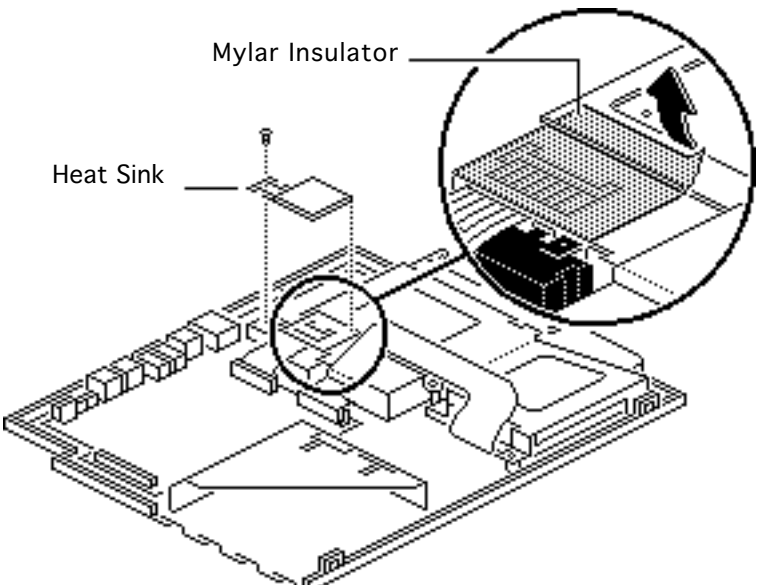


Floppy Drive

Before you begin, remove the following:

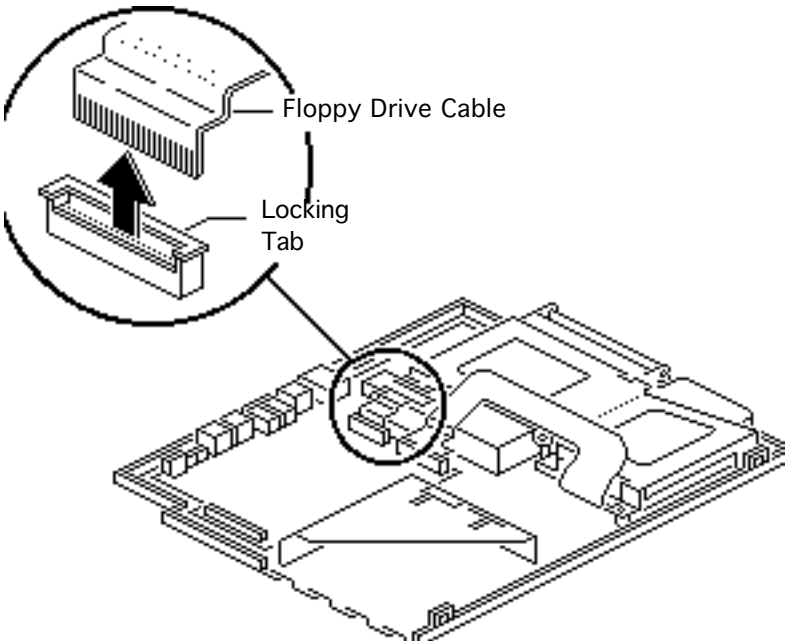
- Main battery
- I/O door
- Top case
- Modem card (if present)
- Daughterboard

Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



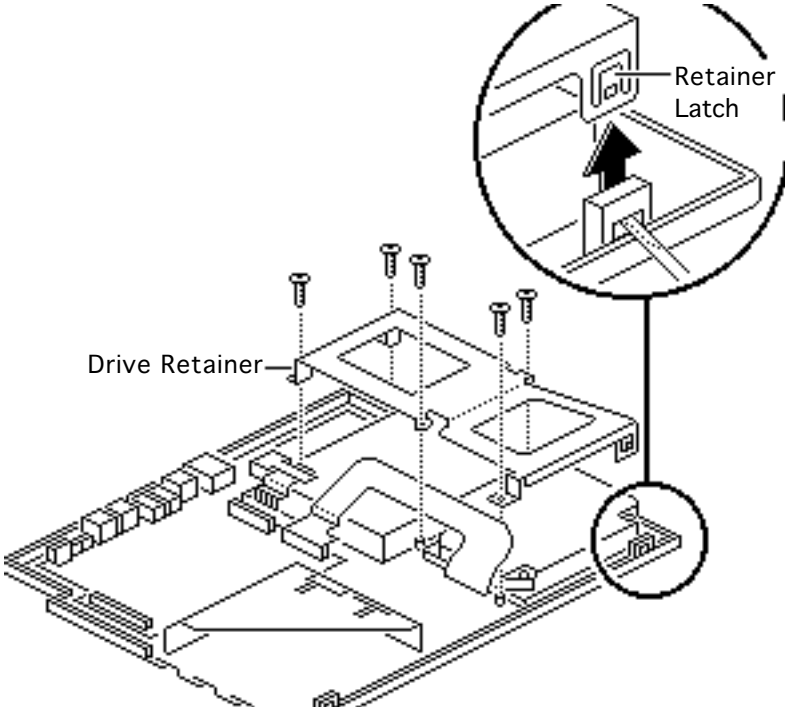
Note: Follow this procedure if a rectangular green heat sink extends over the floppy drive.

1. Remove the screw holding the heat sink over the floppy drive and lift off the heat sink.
2. Remove the mylar insulator attached to the drive retainer.



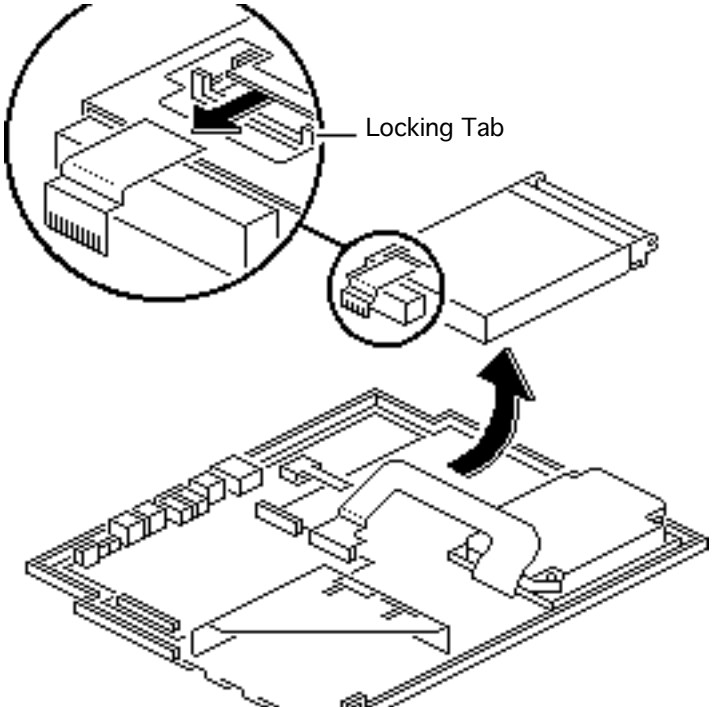
Caution: The floppy drive cable is fragile and should be handled with care.

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



4 Using a T-8 torx driver, remove the five torx screws from the drive retainer.

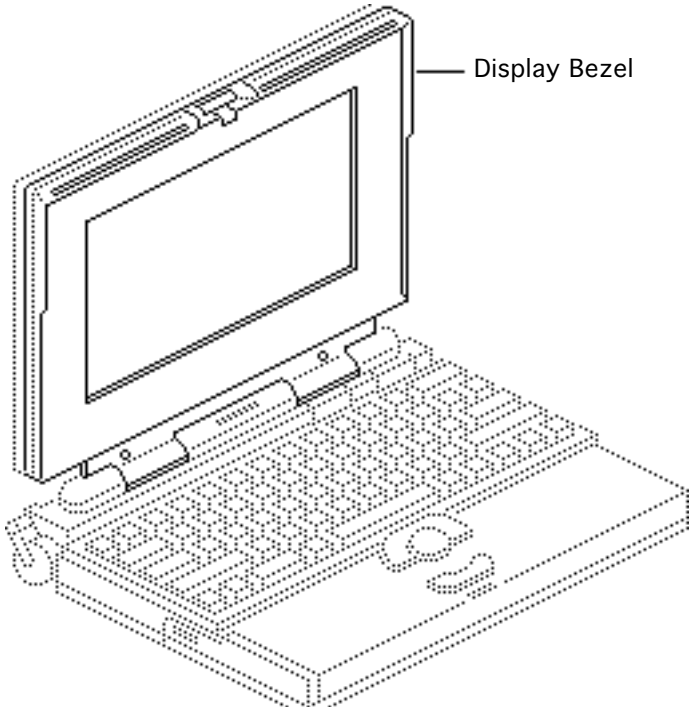
5 Using a jeweler's screwdriver, release the drive retainer latch and remove the retainer.



6 Slide the floppy drive back and lift it from the bottom case.

7 Using a jeweler's screwdriver, push out the locking tab and remove the floppy drive cable from the drive.

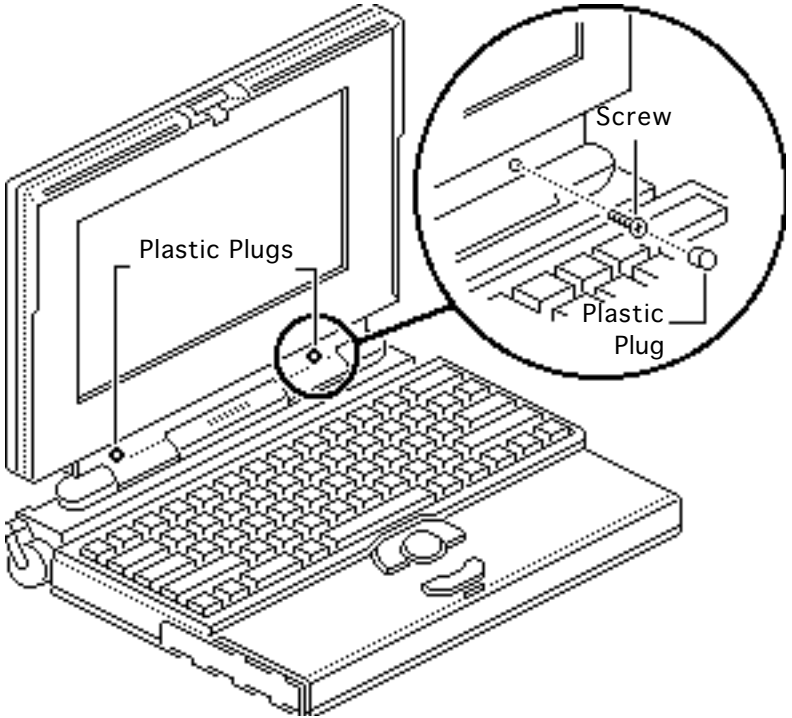
Replacement Caution: When connecting the floppy drive cable connector, fold the cable as shown. If it is not folded correctly, the cable could short.



Display Bezel

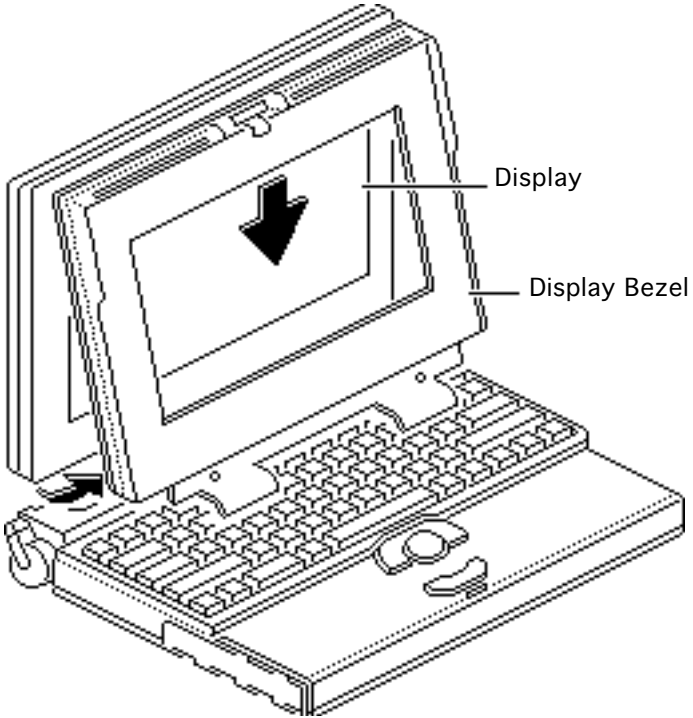
Before you begin, remove the main battery.

Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



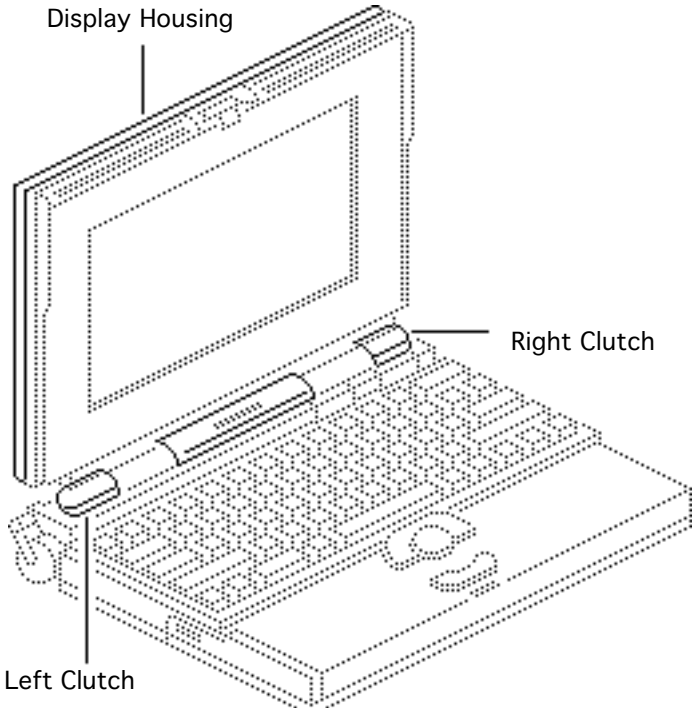
1 Remove the two plastic plugs.

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.

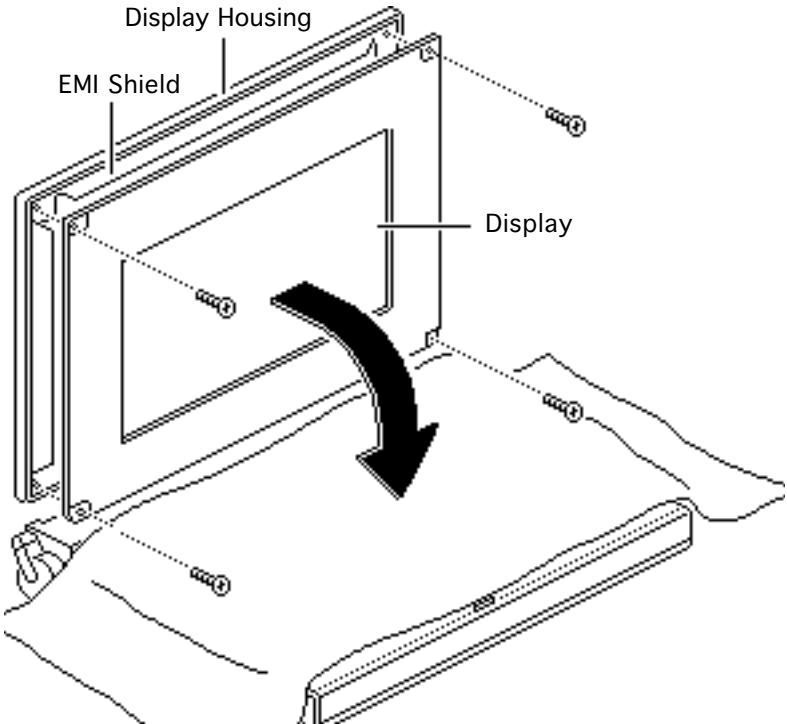


Clutches/Display Housing

Before you begin, remove the following:

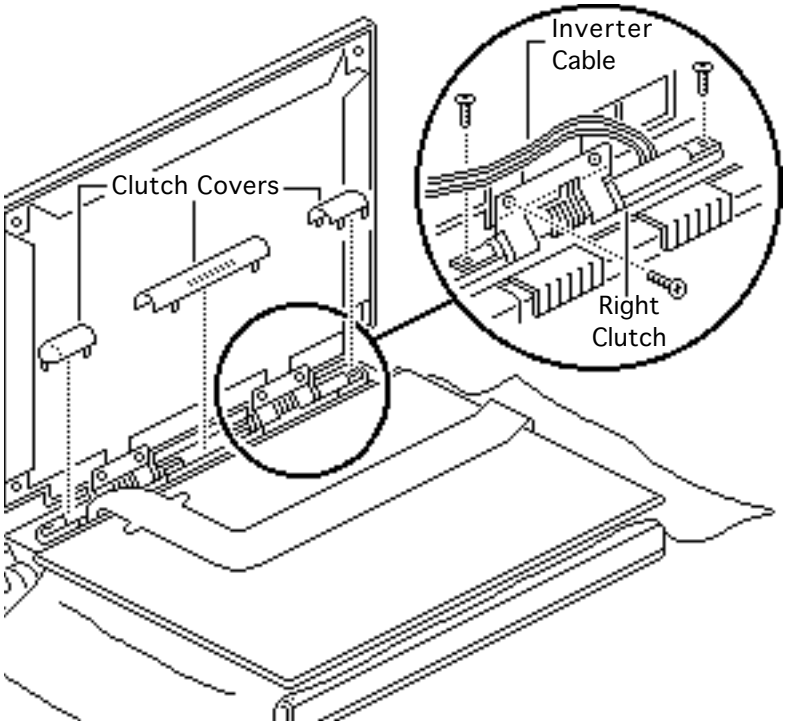
- Main battery
- Display bezel

Caution: The PowerBook 160/165/180 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.



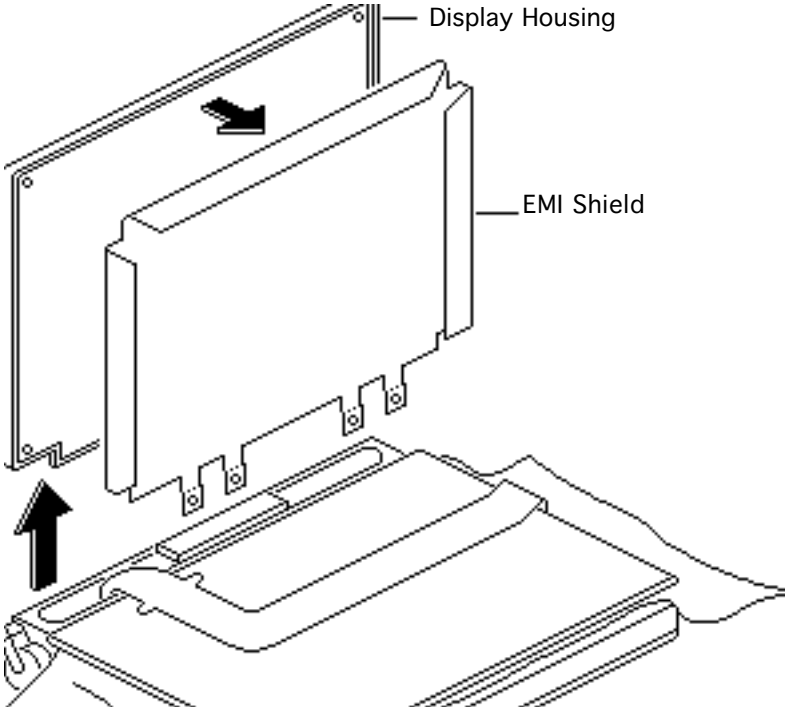
5 Pull off the three clutch covers.

6 Using a T-8 torx driver, remove the six mounting screws from the left and right clutches.

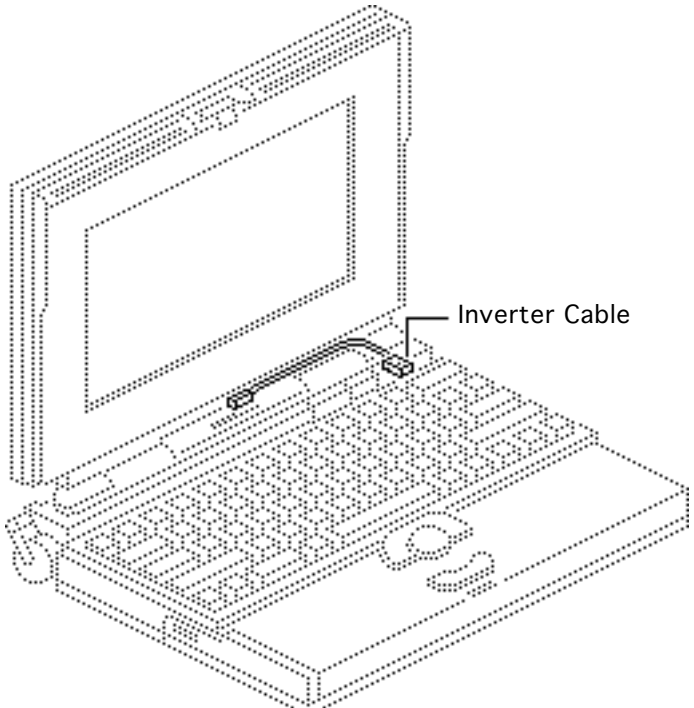
7 Remove the left and right clutches from the display housing.

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

Replacement Note: To avoid pinching the inverter cable, route the cable behind the top-right corner of the hinge on the right clutch.



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

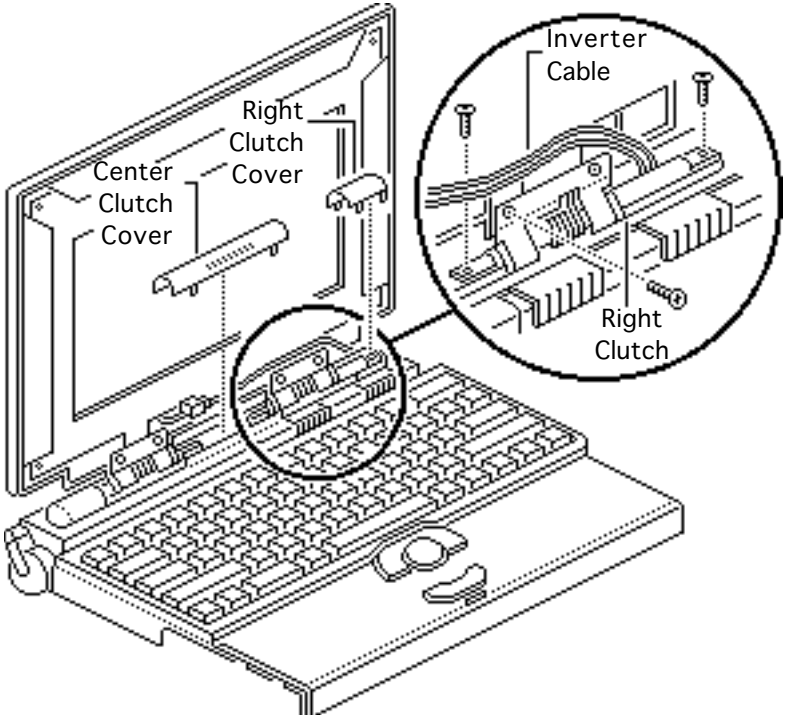


Inverter Cable

Before you begin, remove the following:

- Main battery
- I/O door
- Top case
- Inverter board
- Display bezel

Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

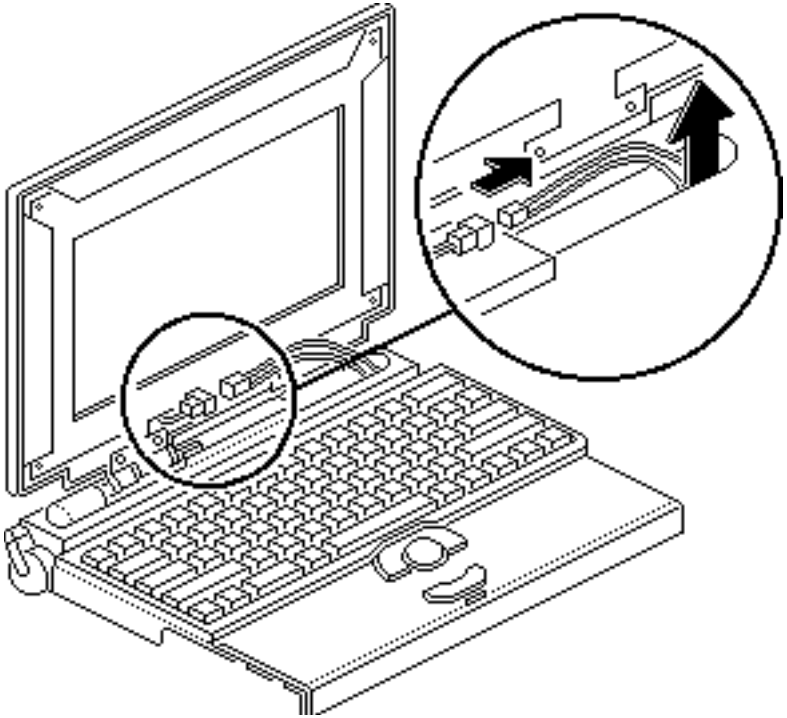


1 Pull off the center and right clutch covers.

2 Using a T-8 torx driver, remove the three mounting screws from the right clutch.

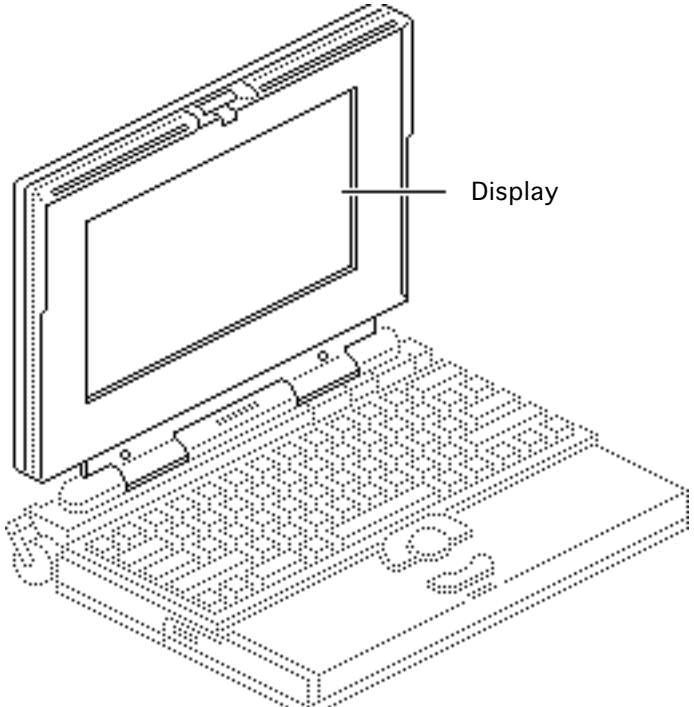
3 Remove the clutch from the display housing.

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



Replacement Note: To avoid pinching the inverter cable, route the cable behind the top-right corner of the hinge on the right clutch.

4 Disconnect the inverter cable and remove it from the case.



Display

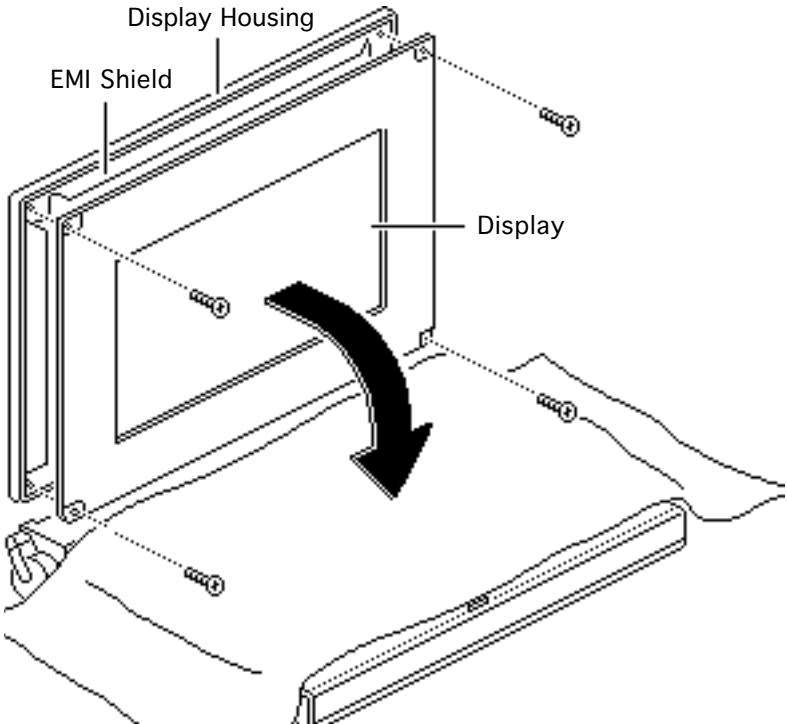
Before you begin, remove the following:

- Main battery
- Display bezel

Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

Note: This topic includes separate procedures for removing the PowerBook 160/165 FSTN display and the PowerBook 180 active-matrix display.

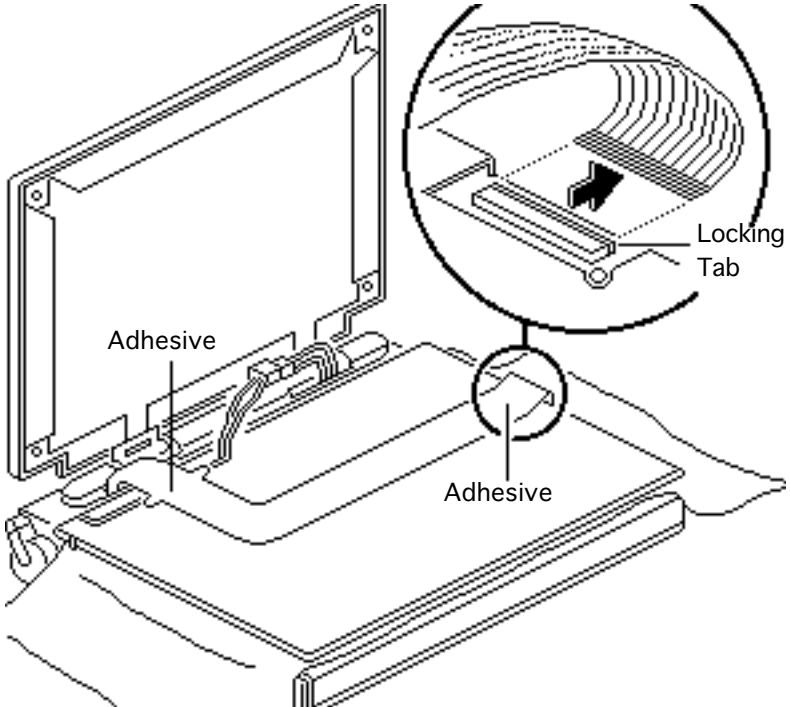
Note: The PowerBook 180 active matrix display module is available to CPRC and international repairers only.



PowerBook 160/165 FSTN Display

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.

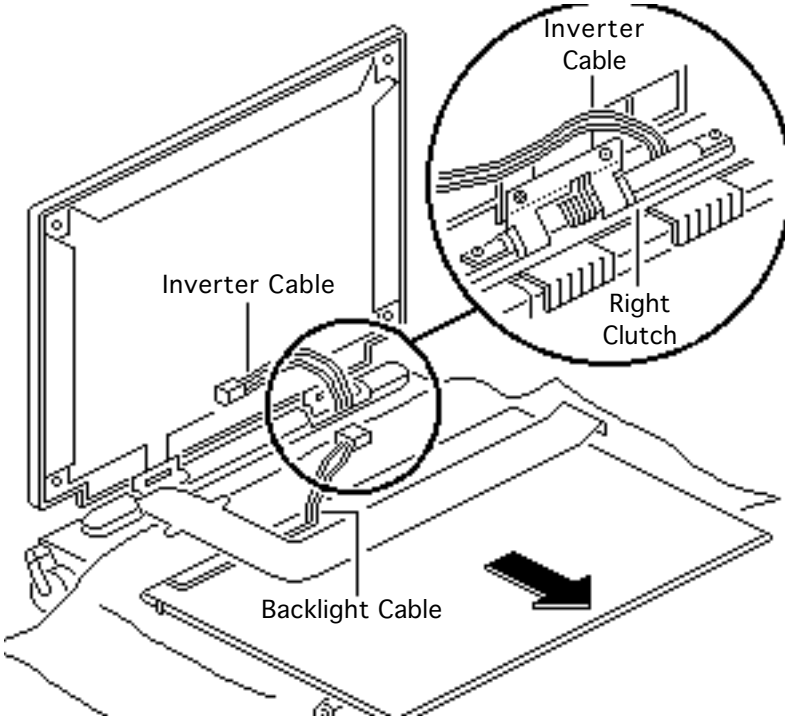


4 Place the display face-down on the keyboard.

5 Lift the locking tab on the display connector and disconnect the display cable.

6 **Caution:** The PowerBook 160/165 display cable is attached to the display with adhesive near the connector and backlight ends of the cable. Carefully pry the cable off the display at these two points.

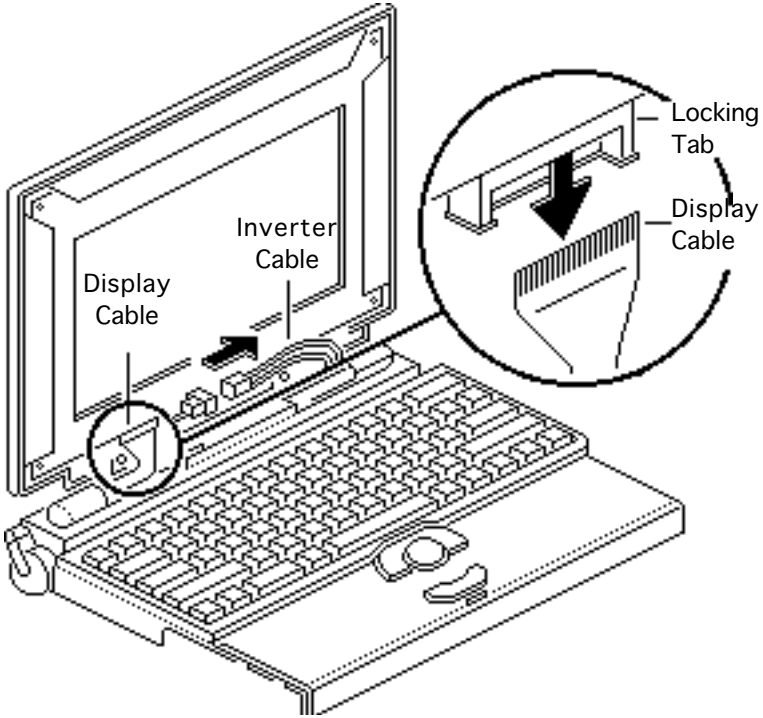
Gently detach the display cable from the back of the display.



7 Disconnect the inverter cable from the display backlight cable.

8 Remove the display.

Replacement Note: To avoid pinching the inverter cable, route the cable behind the top-right corner of the hinge on the right clutch.

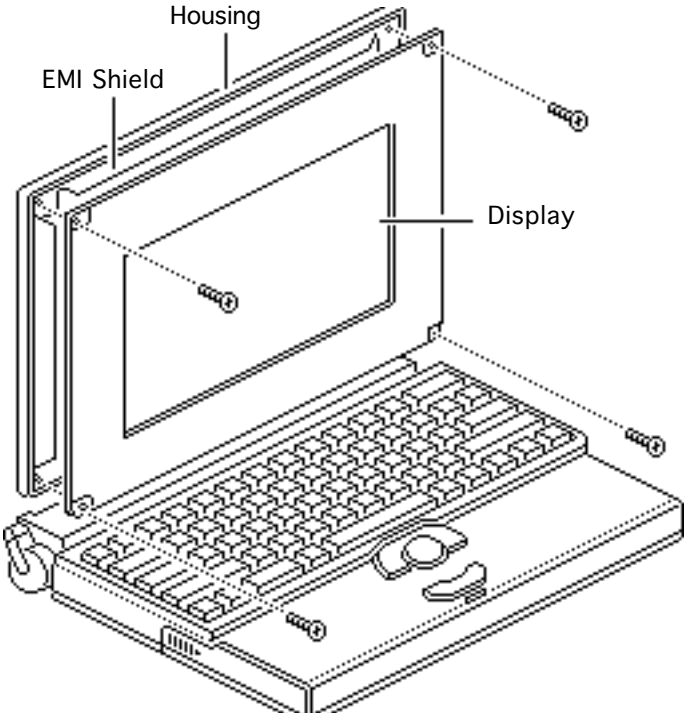


PowerBook 180 Active-Matrix Display

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

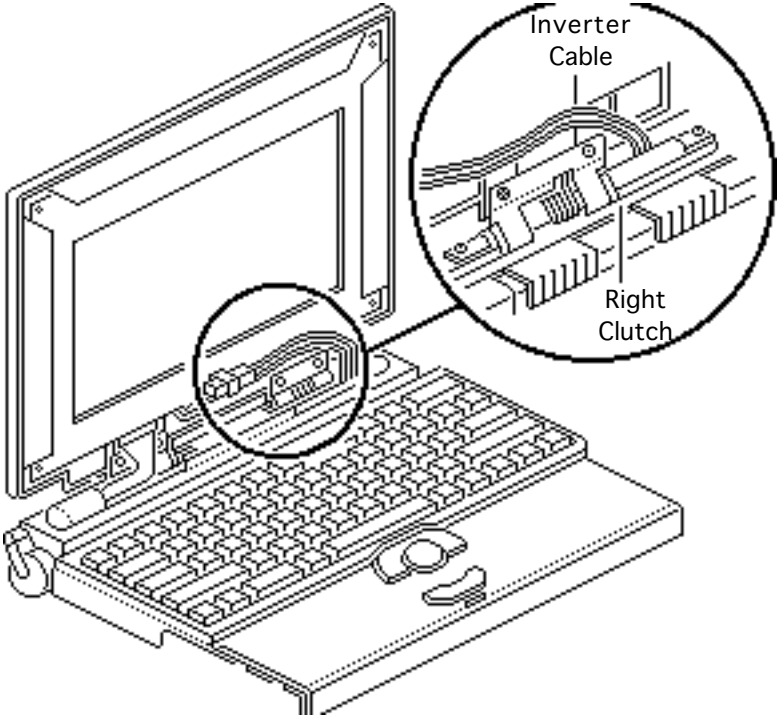
1 Lift the locking tab on the display connector and disconnect the display cable.

2 Disconnect the inverter cable.

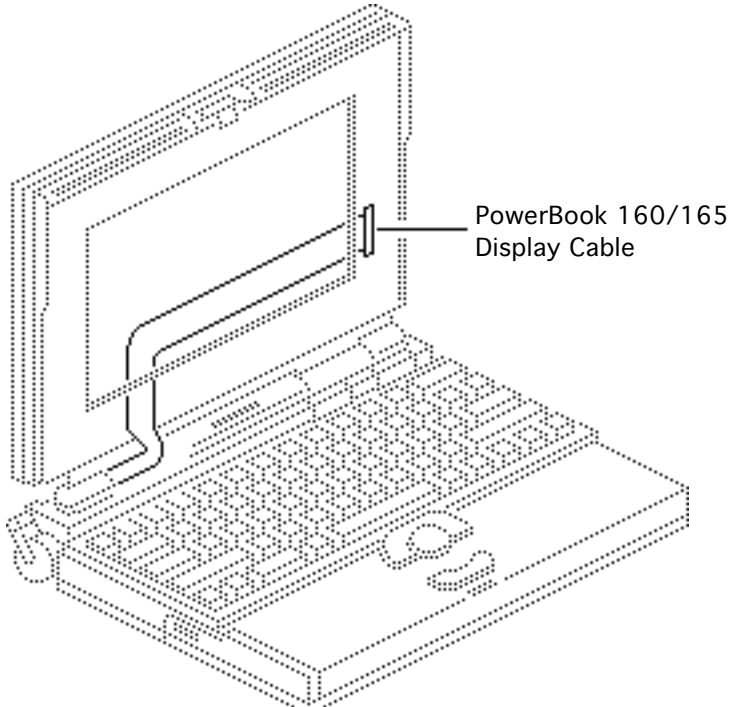


3 Using a T-8 torx driver, remove the four display mounting screws.

4 Remove the display from the housing and EMI shield.



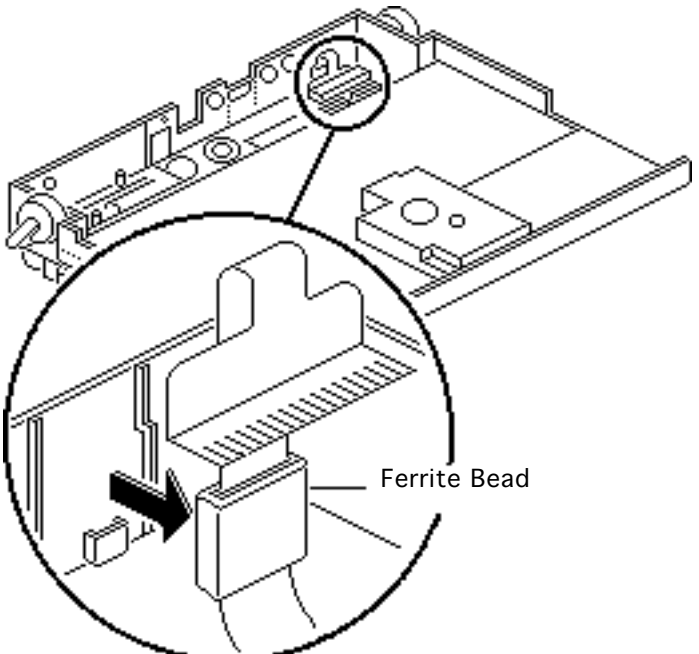
Replacement Note: To avoid pinching the inverter cable, route the cable behind the top-right corner of the hinge on the right clutch.



PB 160/165 Display Cable

Before you begin, remove the following:

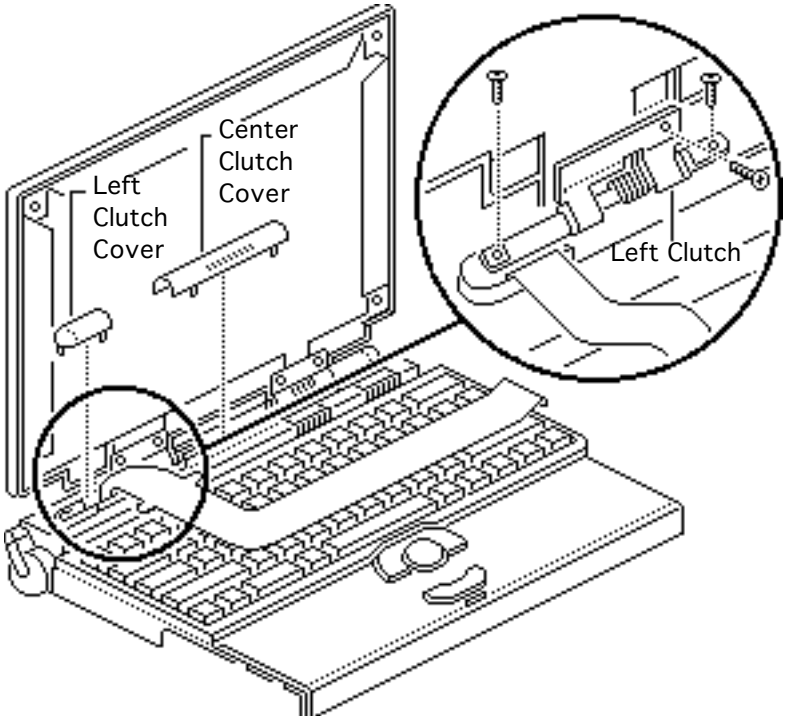
- Main battery
- I/O door
- Top case
- Inverter board
- Interconnect board
- Display bezel
- PowerBook 160/165
- Display



Caution: The PowerBook 160/165 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

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

1 Pry the display cable ferrite bead from the case.

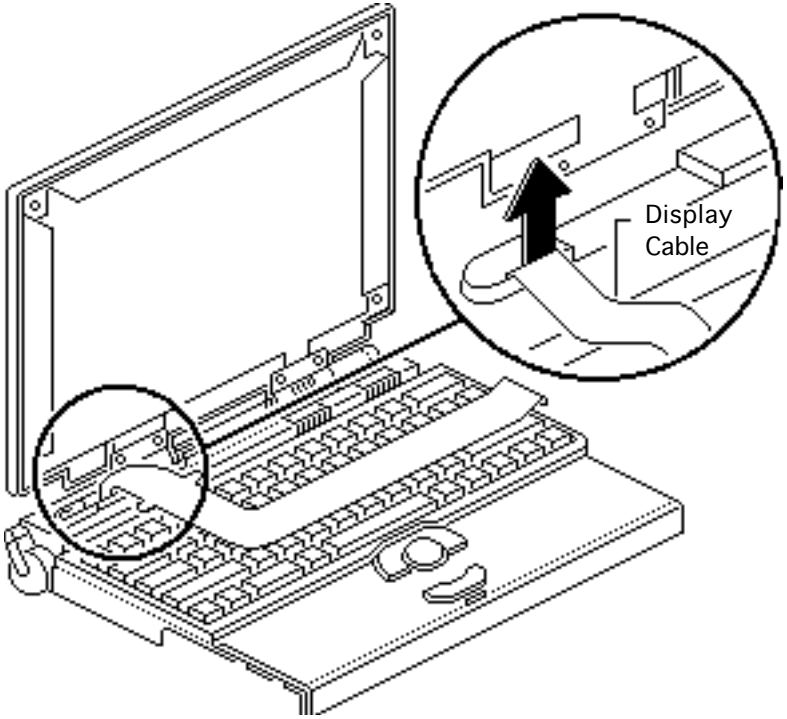


2 Pull off the center and left clutch covers.

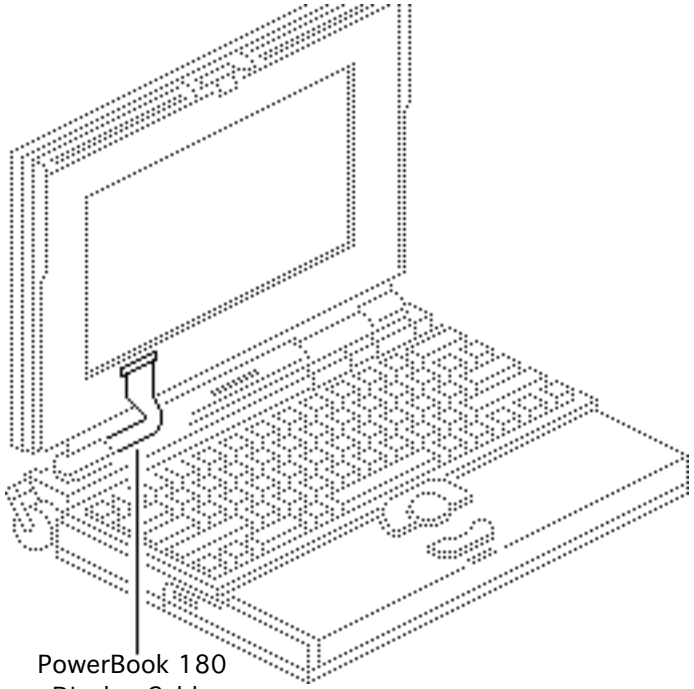
3 Using a T-8 torx driver, remove the three mounting screws from the left clutch.

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.



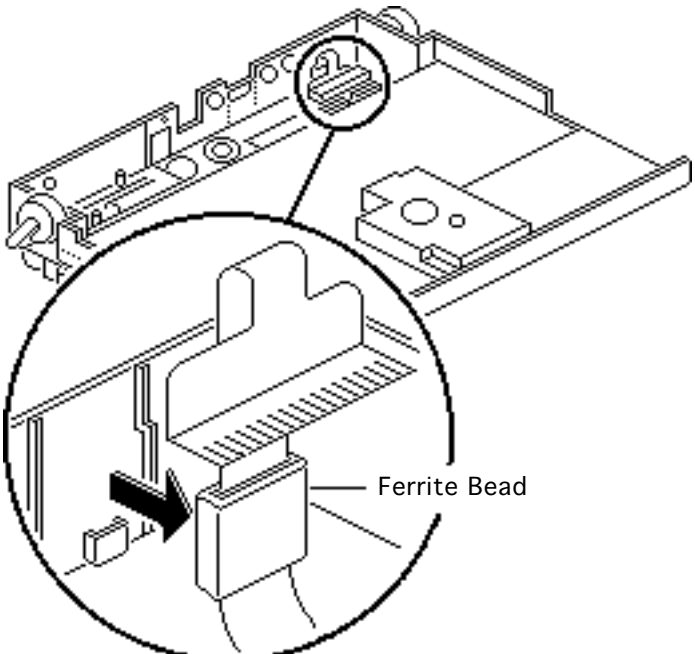
5 Remove the display cable from the case.



PowerBook 180 Display Cable

Before you begin, remove the following:

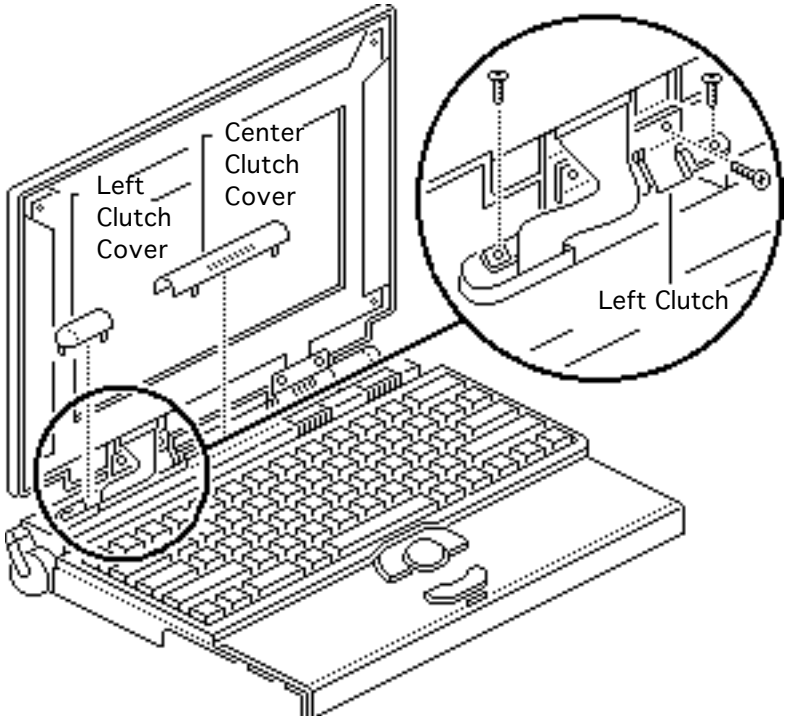
- Main battery
- I/O door
- Top case
- Inverter board
- Interconnect board
- Display bezel



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

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

1 Pry the display cable ferrite bead from the case.

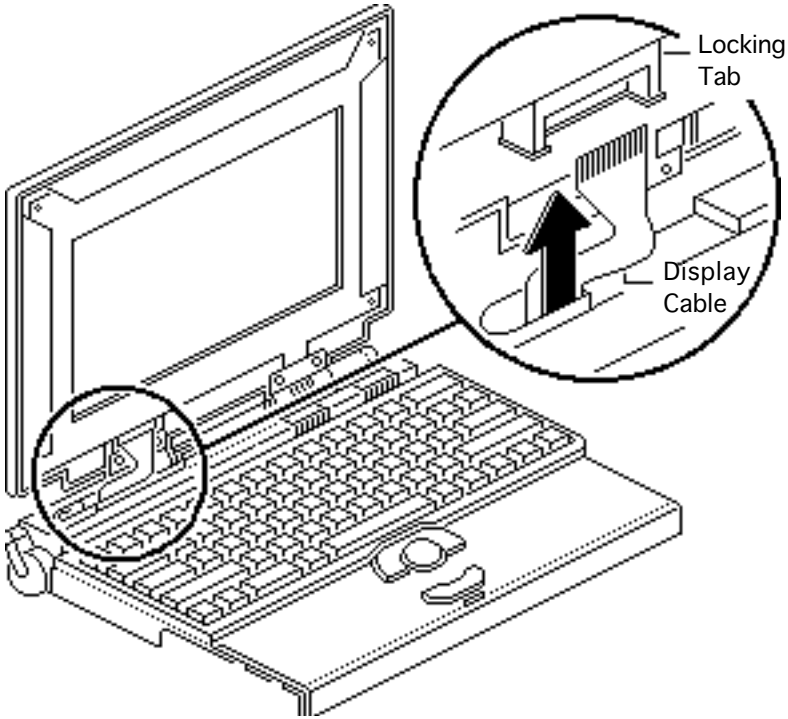


2 Pull off the center and left clutch covers.

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.

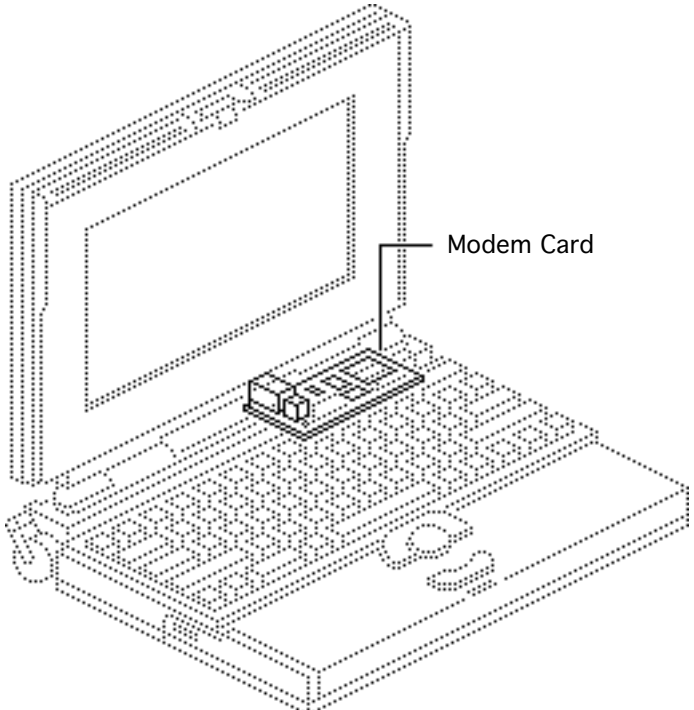


5 Lift the locking tab on the display connector and disconnect the display cable.

6 Remove the display cable from the case.

Upgrades

PowerBook 160/165/180

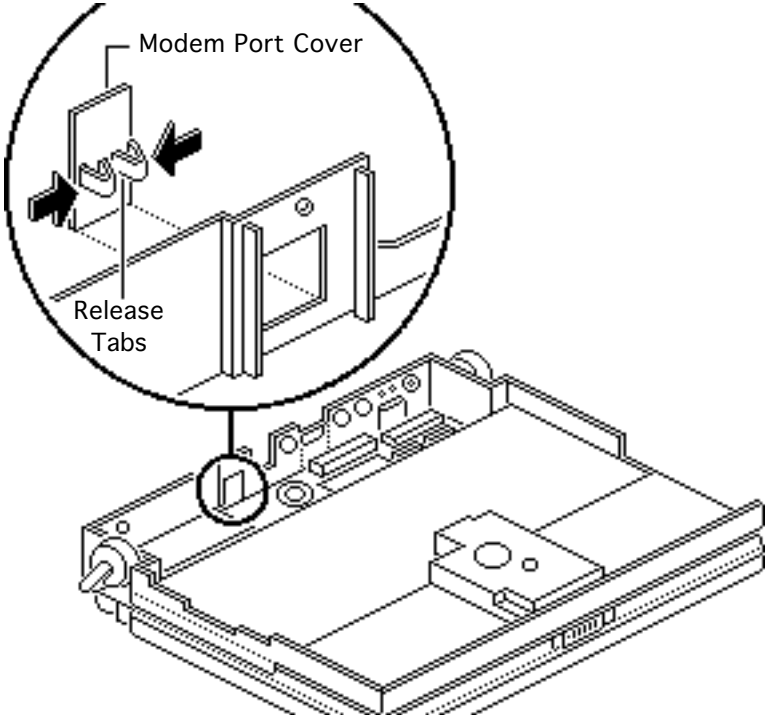


Modem Card

Before you begin, remove the following:

- Main battery
- I/O door
- Top case

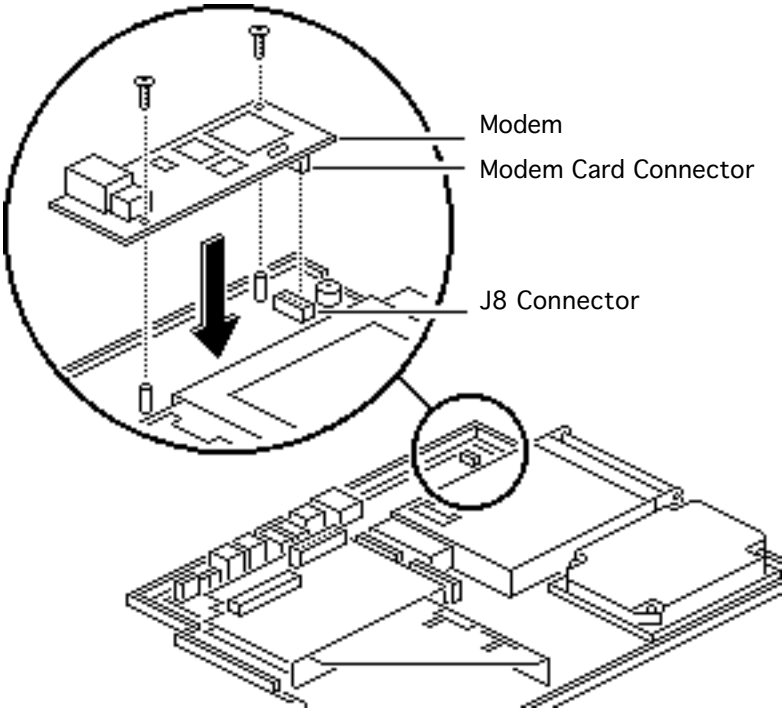
Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.



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.

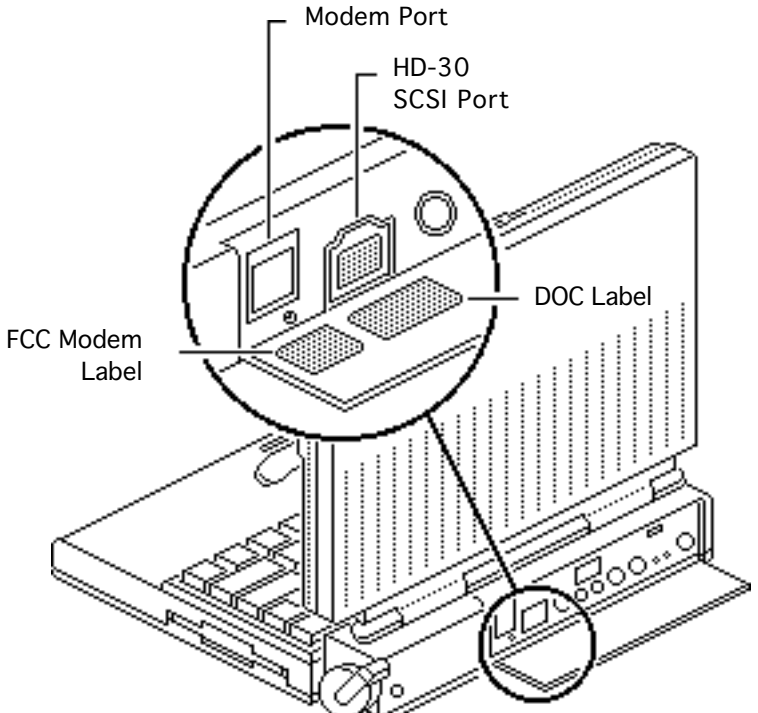
Note: The modem card is an option for the PowerBook 160/165/180.

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



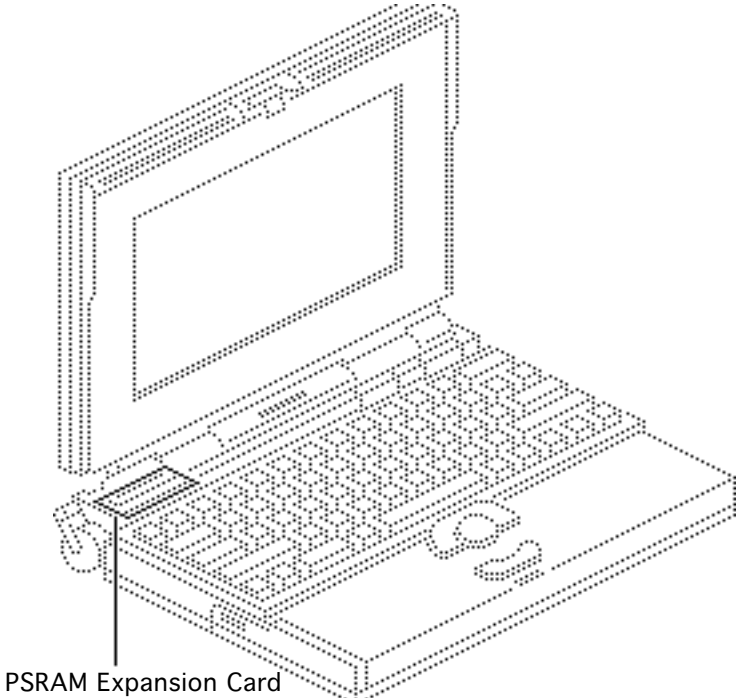
2 Connect the modem card connector to motherboard connector J8.

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

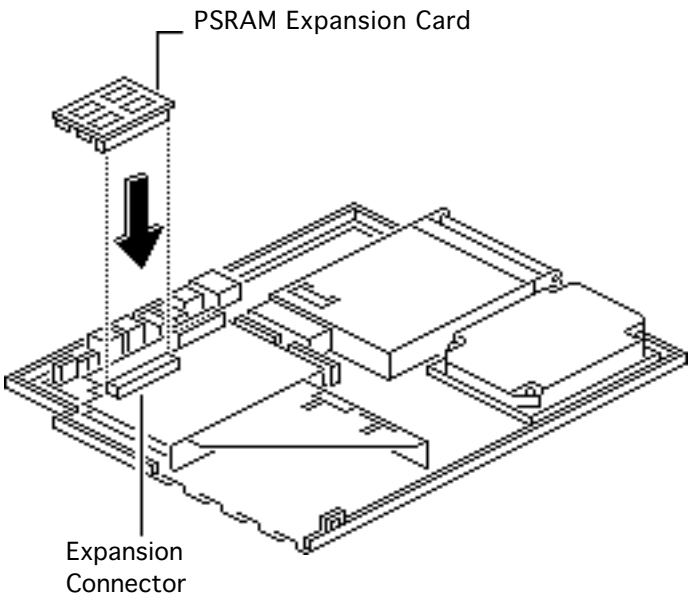
Caution: The PowerBook 160/165/180 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Bulletins/Safety.

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 daugherboard. 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.

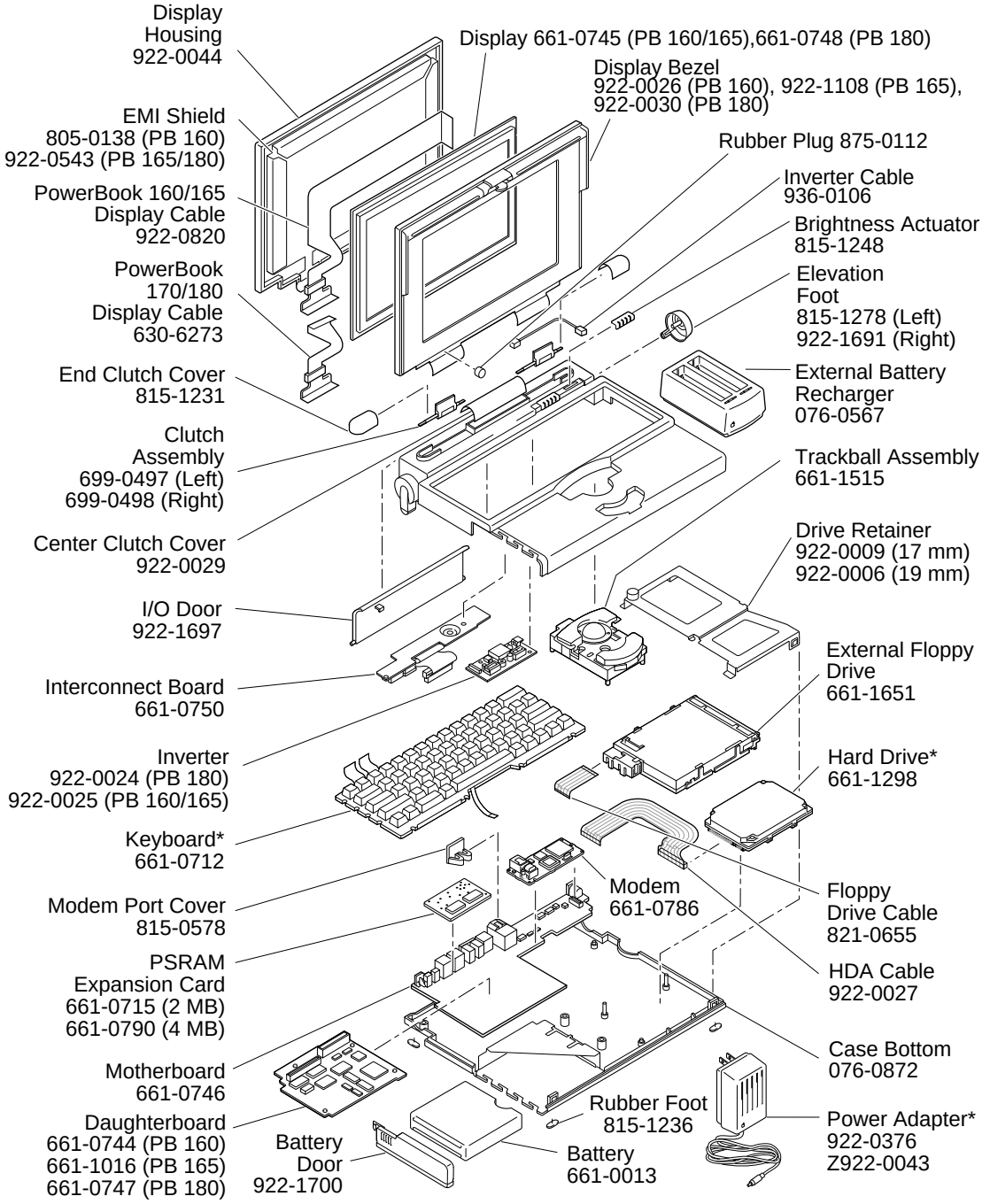


1 Connect the PSRAM expansion card to the expansion connector on the daughterboard.

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.

Exploded View

PowerBook 160/165/180



Product family configurations may vary. For parts with asterisk (*), refer to parts list.

Power Book 160, 165, 180